8930

The Builder

AN

ILLUSTRATED WEEKLY MAGAZINE,

FOR THE

ARCHITECT, ENGINEER, ARCHÆOLOGIST, CONSTRUCTOR, SANITARY REFORMER, AND ART-LOVER.

CONDUCTED BY

GEORGE GODWIN, F.R.S., F.S.A.

LATE VICE-PRESIDENT OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS;

Honorary Member of various Societies; Author of "History in Ruins," "Town Swamps and Social Bridges," "Another Blow for Life," &c.

"Every man's proper mansion-house, and home, being the theater of his hospitality, the seate of selfe-fruition, the comfortablest part of his own life, the noblest of his sonne's inheritance, a kinde of private princedome, nay, to the possessors thereof, an epitome of the whole world, may well deserve, by these attributes, according to the degree of the master, to be decently and delightfully adorned."

"Architecture can want no commendation, where there are noble men, or noble mindes."——SIR HENRY WOTTON.

"Our English word TO BUILD is the Anglo-Saxon Býlðan, to confirm, to establish, to make firm and sure and fast, to consolidate, to strengthen; and is applicable to all other things as well as to dwelling-places."——DIVERSIONS OF PURLEY.

"Art shows us man as he can by no other means be made known. Art gives us 'nobler loves and nobler cares,'—furnishing objects by the contemplation of which we are taught and exalted,—and so are ultimately led to seek beauty in its highest form, which is GOODNESS."

VOLUME FOR 1872.

LONDON:

PUBLISHING OFFICE, No. 1, YORK STREET, COVENT GARDEN, W.C.

Wyman & Sons, Printers,
Great Queen St. London, W.C.

The Builder

Prologue.

THE day that we head our paper with a new date, does not necessarily mark any definite step in our lives and circumstances. The world wakes up much as usual, and man "goeth forth to his work and to his labour till the evening" without any sense of change: the duration of the period indeed is connected with the mechanism of planetary revolution, but the precise point at which we mark it off is arbitrary, and might be as well fixed in June as January. Yet the tendency to regard this recurring season as a new starting point, an occasion for considering our position and our future work, is a natural and healthful one. It is a suggestion for a pause of inquiry as to the direction in which we are travelling, as well as an excuse for what the rowing men call a fresh "spurt." And so in wishing prosperous new year to all our friends, professional and non-professional, it will not be out of place to add a few words of suggestion as to the aim to be pursued by the representatives of architecture in the present day, if they would gain definite and enduring results from the work of this and the succeeding years.

Not that we are going to trouble our readers with an encyclopædiacal view of the position and prospects of architecture, which, indeed, would be in danger of running somewhat beyond the ordinary limits of our article. And there are many practical points, on the importance of which all are pretty well agreed, and which only stand in need of sufficient experiment and investigation, to be regarded with an equal unanimity as to the ways and means of accomplishing the desired ends. But there are other subjects on which no one seems to agree, or to be much nearer agreeing now than ten or twenty years ago. And if there is one subject more than another in regard to which doubt, difference, and contradictory opinions seem to be the order of the day, it is that still vexed question, often so hotly debated of late years, as to the form, the nature, the degree of the purely artistic element which is possible in modern architecture,—a question which, in some of its more recent forms, resolves itself almost into the inquiry whether there is really any such thing as architecture possible in the present day, anything comparable in importance and in beauty to the architectural remains of certain other epochs. Can we hope to say anything new or at all decisive on a subject which has been so much and so variously debated?

To a certain extent, the diversity of opinion on the question of style has been compromised. The "battle of the styles" is no longer carried on in its old form, and an armed neutrality prevails, consequent on the discovery and tacit admission, by partisans on both sides, that the mere revival of an old style will do nothing for us in the long run. A feeling of toleration has been established, partly owing to a really better insight into the principles of architectural style and design; and even one stern Goth is now content to admire and appreciate the beauties of Greek architecture, reserving his contempt for the detested "Renaissance,"—pooh-poohing Wren and all his works. It is satisfactory to find we have men so much greater than the architect of St. Paul's amongst us. More recently we have even seen another exclusively Gothic architect appearing as the champion of conservatism and respect in the treatment of our only Renaissance cathedral. This is so far well, as arguing the approach of a wider and more generalised view of the art of architecture. But there are evidences, among some of the most promising of our younger architects especially, of a growing doubt and dissatisfaction as to the whole status, the *raison d'être* of the profession of architectural design in these times,—a suspicion that the whole thing is possibly in some sort an anachronism: a feeling fostered, if not set on foot, by those who think themselves a rival body,—the engineers. And it must be said that such a feeling might not unfairly be prompted by the architectural history of this country for the last half-century. To the ordinary run of workers in the profession, those who are content to produce creditable and correct designs in the style preferred by their employers—with whom the profession is, in fact, nothing more than a "respectable" way of earning daily bread,—such scruples would not, of course, occur. But to those who take more serious view of the work of their life, and who would be glad to feel that they are busied about work that will not only give them a living, but will be in itself a benefit to society,—something which has to be, and ought to be, done,—the doubt whether they are not engaged in a mere fashion, pursuing a shadow, may occur with disagreeable force and frequency, especially in the face of all the remarks and theories from time to time put forth from one quarter or another. They see that Greek architecture was enthusiastically studied and practised by men of exceptional ability, yet that its modern productions have failed to satisfy either our practical or artistic wants; that modern Gothic architects have strewn the land over with quasi-Mediæval churches, of which people are already beginning to tire; and on the other hand architectural critics are ever found repeating that a new style cannot be deliberately made, and that some forms already in existence must be taken as a starting-point to work from. What is the truth out of all this contradiction? "Where shall we find the concord of this discord?"

The temporary character of the Gothic "revival," as it has mostly been practised, can scarcely be doubted. There has been such a blind admiration of everything Mediæval,—such a systematised copyism,—such condemnation of attempted progress,—the whole movement has been so closely associated with other mental tendencies and prejudices,—that architecture has been, in the main, reduced, more than at any other period, to a great dilettantism,—a mere medium for assisting in the reproduction or depiction of the lifeless features of a past age and state of society. On the other hand, it is not to be supposed or expected that men with any strong feeling for the beautiful and picturesque in building, practising as architects in the present day, must or can shake themselves free from the influence of the monuments of a greater age of architecture: nor is the fact that they cannot do so a clear proof that there is neither artistic genius nor originality among us in this century. For it must be remembered that the productions of the greatest periods in almost every art,—those which remain as standard examples for admiration and imitation,—have arisen at a time when the best part of the mind and enthusiasm of a nation has been directed towards that particular object. The Italian intellect of the fourteenth and fifteenth centuries was directed to painting, as one of the noblest objects of life, which might well employ the powers of the first men of the day. The English intellect of the Elizabethan era poured itself out in the drama; that of the Edwardian period found its expression in architecture; and the excellence of the dramatic and architectural works of the two periods is to be traced, in great measure, to the fact that in each case dramatic and architectural art, respectively, formed the one chief outlet for artistic expression, to which everything else was subordinate and subservient. The mind of the present age is more active, perhaps, than at any of those former great periods of art-production; but it is divided,—its strength is spent and distributed over a score of different forms of expression. Could we, by any magical spell, shut out suddenly from the educated England of to-day all artistic interest, all media for artistic expression, except architecture,—could we, at the same

time, furnish the same opportunity and excuse for the erection of great buildings which existed in the Middle Ages,—we should probably see a new growth of Architecture before long, in forms as impressive as any already existing. But we cannot do this: only a small part,—a very small part,—of the national mind is given to architecture at present; and that part is not in itself strong enough to escape from the impression left upon the art by the builders of a more purely architectural age. It is the same in other arts: we see it in the enduring influence of the school of Italian painting; still more remarkably, perhaps, in the almost ineffaceable impress left by that purely æsthetic people, the Greeks, upon the artistic bent of mankind since their day,—as Lord Houghton has elegantly expressed it, in a little poem entitled, "The Flowers of Helicon,"—

> "And downward thence to latest days
> The heritage of Beauty fell,
> And Grecian forms and Grecian lays
> Prolong'd their humanising spell,
> Till, when new worlds for man to win
> The Atlantic's riven waves disclose,
> The wildernesses there begin
> To blossom with the Grecian rose."

Certainly this neo-Greek blossoming on the other side of the Atlantic may not be, if looked at closely, exactly the kind of thing that an architectural critic would be enraptured with; it may be paired off, perhaps, with that resurrection of Mediæval castles which a New York paper assured Mr. Ruskin he would find if he visited their city. But what we would indicate is, that the impress of the great age of every art, the age when that particular art was all-in-all to men, will not and cannot be effaced; that it must, and, indeed, ought, to influence those who aim at carrying on the same art in an age of more multifarious efforts and more divided aims. And, therefore, it is not fit that critics should hoist the black flag, and cry "no hope," because it is found scarcely possible to produce a pleasing architectural design in the present day, which shall not be largely based upon the features of one of the great styles of former times. It is natural and inevitable that it should be so. What is required is, that this adaptation from former styles should begin, so to speak, at the right end. The Gothic revival was not purely an architectural movement. It is a feature only in a temporary revival of modes of thought and feeling which were once part of the very life of the nation; a kind of blowing up of old embers, which is a very common phenomenon in history. Of this artificial revival, the modern Gothic architecture is part of the scenery; one of the "properties" of a very theatrical display. But it need not be used so. If instead of adopting the outer forms of the Mediæval buildings in the first instance, as we have mostly been doing in our churches, and fitting the use of the building to them, we begin at the other end, and, after considering the wants and requirements to be met, take suggestions from the Mediæval builders for their architectural treatment—hints to be worked out further, improved upon, adapted to the particular case in hand,—there is no reason why the study of Mediæval architecture should not exercise an influence in favour of, rather than adverse to, real originality. For originality consists quite as often in doing better, or in applying in some new manner what has been done before, than in absolutely creating a completely new form. We have instances among the works of modern architects,—not very numerous certainly,—in which this has been accomplished; in which we may see features and a mode of treatment clearly and ostensibly based on Mediæval models, and yet as clearly stamped with the modern designer's own individuality. And that designs so evolved may have a lasting and real artistic interest we may infer from comparing the results of a similar proceeding at another epoch in architectural history. We hold the Italian Renaissance to have been beset with serious, deep-lying faults and misconceptions, so far as architecture is concerned; but will any candid critic affirm that there is nothing in the designs, for instance, of Palladio and Sansovino—nothing in their working up and combining of classic details,—which has added to the domain of *inventive* design in architecture?

And it is in such consideration that we must find a reply to those who are inclined to look at engineering as the sole possibility in the present day. It has been suggested that the engineering works of this century are to us what the cathedrals were to the thirteenth century; that they may hereafter be studied as models, though some may not suspect it now. There is a sort of basis for this idea in the fact (as we believe it to be) that few great things that have been done in the world have been recognised as great at the time of their being carried out. Possibly the Mediæval architects had no idea that they were doing anything which would be the admiration of a future posterity, just as Shakspeare probably was not aware of the real value to mankind of the great dramas which he was so carelessly giving to the world out of his superabundant treasury of intellectual wealth. But is it at all conceivable that at any future period any one would think it worth while to sketch, either *en masse* or in detail, the features of our principal engineering works, from mere interest in them as beautiful and expressive objects? Can any lapse of time render the tubular bridge at the Menai Straits an object of pleasure to the eye? And in another point, too, the parallel scarcely holds good; for we should say the engineers of the present day have a very strong idea that they *are* doing great things, and make little concealment of their opinion on that point. The subject is recalled anew by the very suggestive paper "On the Progressive Use of Iron in Building," read at the Conference of Architects, and which we printed last week. The opinion therein expressed, that the true architectural work of the present days lies in the right and artistic treatment of iron, is one which is frequently paraded in different quarters at present, and in which there is a certain degree of truth. But, like many other people who have got a new hobby, the advocates of this view override it a good deal. Mr. Aitchison thinks we had better have everything ugly, so long as it is our own. The alternative is not quite so desperate as that. We wish to have things that are beautiful and pleasant to look at around us, if possible; and when the writer of such a paper implies in one sentence that he can see no beauty in the generalisation of foliage in a Gothic capital (calling it a "coarse burlesquing of nature"), and elsewhere finds admiration for so clumsy and bungling an artifice in building as the holding up of a long stone lintel by concealed iron supports, we must conclude his "common sense" to be a little stronger than his artistic sense, and receive his observations on such points with caution. But there is a fallacy in the parallel drawn between stonework and ironwork in architecture, which seems to be oddly overlooked. Iron is not, like stone and timber, a purely natural material: it is one mechanically and chemically worked up to a condition for use in building. It is, therefore, under different conditions practically and architecturally; practically, because we do not really know how long it will last; and architecturally, because it can never combine with landscape as a stone or even a brick building will. If the Mediæval builders had been acquainted with iron, and roofed their cathedrals with it, it is probable that not one such roof would be left now: and on architectural grounds, the parallel between the cathedral vault and the railway-station roof will not hold good, because it is evident that the builders of the former did look upon grandeur of effect as an object,—their buildings not being indeed utilitarian in a strict sense,—and it is certain that the designers or constructors of our railway-station roofs have no such aims. The point which might most reasonably be urged in favour of iron as the modern material, is that society is more changeable and mobile than formerly; that it may be more convenient to have comparatively temporary structures than vast piles made to last for generations. But even this argument, which would have a certain truth in it, we suspect would prove to be only very partially applicable. That iron is an important addition to our stock of building materials, and that there is an interesting problem for the modern architect in realising and perfecting a satisfactory and characteristic architectural treatment of it, is perfectly true. But why, because iron is discovered, stone should be any worse than before, we fail to see; and must label the dictum, which would call this the "iron age" of architecture, "not proven."

Another feature in the published report of the Conference proceedings, however, is suggestive; viz., the large space occupied by the purely practical papers, especially those dealing with treatment of new materials, and (on the whole, we must say) their superior interest and value. It is in the treatment of new practical requirements in general, and in the endeavour to bring these under the domain of architecture properly so called, that the most interesting and fruitful problem for the modern architect may be said to lie. And most particularly this may be said in regard to town architecture. We are obliged to crowd together, in towns, for the needs of manufacture, of commercial as well as social intercourse. To make our towns, our streets, by little and little less hideous, less depressing in aspect, without involving a disproportionate outlay; to render our private houses edifices pleasant and suggestive to look at, as well as comfortable to live in; these are points in which modern architecture with us has made but insufficient progress as yet, and in the course of endeavours to solve these the modern architect, if his interference be permitted, may find plenty of suggestion for novelty and originality of treatment. This kind of task, of course, seems prosaic, in comparison with the building of cathedrals, and yet it has its nobler side, too; and perhaps such humbler efforts, as they may seem now, would be as likely as any others to bring us to the "Golden Year," according to Tennyson's reading of it,—

> "Old writers push'd the happy season back,
> We forward,—dreamers both; for well I know
> That unto him who works, and feels he works,
> This same grand 'year' is ever at the doors."

THE COAL QUESTION NOT ADVANCED.

VAGUE statements of contradictory opinions, illogical inferences from stated premisses, blinking the main points at issue, and total failure to grasp the important question referred to them for inquiry, such are the salient features of the "Report of the Commissioners appointed to inquire into the several Matters relating to Coal in the United Kingdom." It may be thought that it was from a dutiful wish to frame their language on the model of the very questionable English employed in the phraseology of the Commission itself, that the Commissioners have so successfully avoided the use of that terse, idiomatic, perspicuous style which would have been proper to a practical report on a subject of such deep national interest.

In fact, it can only be considered as a solemn mode of trifling to refer a question which should have been entrusted to the skilled investigation of a competent civil engineer, to the *dilettante* hands of a Scottish duke and fourteen assessors. That respectable, even eminent, names are upon the Commission, there is no doubt. But what good service can the country expect from fractions of scientific or practical men bound up in an unorganised mass? "By snatches of time, now and then, from other duties," writes one, "I have got through my Coal Commission Report" (p. 71). "Preliminary estimates of the work to be done, and the cost incurred," writes another, "proved insufficient, both as regards time and cost." "I beg to record my earnest protest," are the words of the most eminent member of the Commission, "against the statement made in page xii. upon the probable existence of coal-fields under the cretaceous and other secondary rocks in the South of England." Mr. Elliot disagrees with the introduction into the Report of a calculation by Professor Jevons, the only calculation, by-the-bye, that has been verified by fact. Accord of any kind appears only to have been arrived at, by the careful suppression of any individual opinion, sage counsel, or practical issue of the five years' occupation of the Commissioners.

The Report commences with an elaborate statement of the mode in which the fifteen discordant Commissioners proceeded still further to pulverise their corporate existence by splitting themselves first into five, and then into seven, committees; the aptness of each of which for its task was insured by the original device, "that any member of the Commission should have leave to serve on any committee he pleased." It is true that the words follow, "in addition to that specially assigned to him." "The members chosen," it need not, therefore, surprise us to find, "proceeded, each on his own plan, to investigate." It is satisfactory to learn that, by "the 9th of June, 1871, the work," which had been authorised on the 28th of June, 1866, "had so far advanced that the reporters held their first meeting," when they "forwarded a draft report upon twenty-three sub-reports." We wonder how long Isambard Brunel or Robert Stephenson would have taken, to draw up a report on this great engineering question, which really would have shed some light on the prospects of the future.

The object of the Commission, or rather what

ought to have been proposed as an object for the serious inquiry of a competent man, whose entire attention should have been exclusively given to the investigation, can only be inferentially arrived at, from the boggling language of the Commission, which the Commissioners quote at the head of their Report. That object ought to have been three-fold. First, to ascertain what quantity of coal exists in the United Kingdom, within practical limits of economical working, regard being had not only to absolute depth from surface, but to thickness of seam, and to mineralogical value of coal. Secondly, to state the actual consumption of coal, and to show, too, in what ratio, according to the statistics now attainable, that consumption may be expected to increase, regard being had to any increase in the cost of working. Thirdly, to point out the indications thus afforded of the probable diminution, increased cost, or even general arrest, of the coal supply of the future, and to indicate such improvements, engineering or legislative, as may seem called for to prevent waste, or, in any other useful manner, to husband our supply.

There can be no doubt that a report that should reply to these questions, as intelligently and definitely as one of the great engineers, whose names we have mentioned, would have replied to them, would have been a statistical paper worth some outlay of public money to obtain. How it is that no such report has been even attempted by this cumbrous and protracted Commission, it is for them to settle with those who appointed them. They appear, in fact, to have been instructed in the most slovenly manner, and to have by no means bettered their instructions by their mode of carrying them out. We speak, it must be understood, of the general Report, rather than of the more shipshape details on which it is based.

The Commission, indeed, does call for a Report on the quantity of "coal which may be reasonably expected to be available for use." The mode in which this has been dealt with, is as follows:—"Doctor Sanderson,"—for it is characteristic of the Commission to hang their main assumptions on individual, and sometimes very slender, pegs,—"states it to be his decided opinion that labour is not practicable in moist air of a temperature equal to that of the blood, namely, 98 degrees, excepting for very short intervals." It is unnecessary to say that we fully agree with Dr. Sanderson, although a reporter more familiar with the subject might have stated the facts in a more practical manner. "The depth," the Commission continue, "at which the temperature of the earth would amount to blood-heat, is about 3,000 ft." We may remark that there is good reason (as admitted in a note) for calculating that this temperature, at which men cannot work, except for very short intervals, is attained at a depth of 2,690 ft., and that the pressure of damp heat upon the vital force is already considerable at 2,000 ft.; a matter of not much commercial importance in reviewing the question of cost. A margin of 420 ft. in depth is, however, added by the reporters, in virtue of a difference of 7 degrees in temperature, between the heat of the working faces and that which they impart to the air. The evidence, however, reduces that difference from 7 degrees to 3 degrees. This is a question not only of efficiency of ventilation, and of the length to which the "long-wall system of working," which is credited with this advantage, is carried from the shaft, but of actual earth-temperature. A further depth of 580 ft. (giving an additional rise in temperature of from 10 degrees to 11 degrees, and a corresponding amount of barometric pressure,—an element disregarded by the Report) is then allowed for "possible expedients which the future may elicit for reducing the temperature"! It is therefore "assumed that a depth of at least 4,000 ft. might be reached." At what cost is not inquired. That is to say, a theoretical addition of 1,310 ft., or of nearly 22 degrees Fahrenheit of temperature, beyond the depth at which, according to the evidence, men cannot work except for very short intervals, is "assumed" for the purpose of arriving at a round number of an agreeable magnitude. On this highly business-like and satisfactory assumption, the value of the labours of the Commission is made, in the first instance, to depend.

But we have not yet exhausted the assumption of Committee A. Even giving them their margin of 33 per cent. for contingencies, or for the possible outcome of lucky inventions, all carried to the credit side of the account, nothing is more certain than the fact, that a large proportion of the coal, above the limit of practical working as far as depth is concerned, will never be brought to the surface. The Commissioners have, indeed, admitted this principle by limiting their calculations to beds of more than 12 in. in thickness. But it must be borne in mind, that with every fathom in depth, the great expense of opening a mine, the sinking of the main shaft, increases. The deeper the mine, the greater the area of the subjacent mineral that must be wrought from a single shaft, economy being duly considered. Without attempting to fix the inferior limit of the bed which may be thus economically wrought at a great depth, it is evident that 12 in. is ridiculously under the mark. Indeed, the bathometrical limit must depend, in a great measure, on another element, entirely left out of sight by the Commissioners, namely, the mineralogical character of the coal. Between the total quantity of coal within 3,000 ft. or 4,000 ft. of the surface, and the total quantity of coal worth winning at these depths, there is an enormous difference. The Commissioners seem to think that if a spade is a spade, coal is coal. As to details of what every particular bed of coal is worth chemically, they evidently despise them. Have they not taken five years to make a report, such as it is? Would they not have required five-and-twenty years to frame such a report as we suggest? Let us be thankful for what we have got. If we are discontented, the Report has a word of comfort. "Every hypothesis must be speculative" (p. xvii.). Very true; but we hardly needed to go to a Cabinet Minister, and his colleagues, to be taught as much as that. In fact, a right acquaintance with the Greek tongue might lead any one to imagine that the phrase, though brief, is tautologous.

While thus the amount of coal practically likely to be worked is not even guessed at by the Report of this Commission, let us inquire how it fares with the second question, that which regards the probable future rate of consumption. Here, any one who looks at the Report with the admiration natural to ignorance, will say,—We have at least valuable matter! Here we have tables and diagrams, population curves, and decennial ratios! If the Commissioners do not know how much coal we have, they have at all events told us how long we shall be, before we expend that unknown "hypothetical" quantity.

Unfortunately, the same inability to make any practical use of the valuable information collected by the various committees, that characterises the Report under the first head, adheres to it consistently throughout. We are first told that 146,000 millions of tons of coal would last for 1,000 years, if burned at the rate of 146 millions a year; which profound arithmetical discovery is presented to us in two or three alternate shapes. A volume which was published in 1865 is then quoted, as giving an estimate that all our available coal will be exhausted in 110 years; and "yet another view" is placed before us, according to which, our supplies will last for "upwards of 1,273 years." Between these rather wide limits, the Report leaves its readers to please themselves.

It does, however, although still with the same conscientious fear of incurring the responsibility of an opinion, detail an intermediate hypothesis, which it illustrates by tables and a diagram. Nothing can more strongly show, to any mind accustomed to deal with statistical information, the puerile character of the Report (as distinguished from the materials on which it is founded) than the selection of these hypothetical illustrations for prominent publication. The increase of the population of Great Britain in the decade 1811-21, was 1,971,416. In the decade 1861-71, the increase was 2,737,416. The first increase was at the rate of 15·977 per cent., and the second at the rate of 11·736 per cent. Thus, with a very rapid and augmenting actual increase, the rate of that increase, calculated on the numbers from which the comparison starts, in each instance, shows a diminution. It is assumed that this diminution in the rate of increase will continue; and a curve is drawn on that assumption, which arrives at an estimated population of 132,000,000 for the year A.D. 2231; to which date the exhaustion of our coal is considerately postponed, by this calculation. It is, however, left out of sight that while the rate of increase diminished from 1811 to 1841, this diminution began to disappear in the following decade; while from 1861 to 1871 the rate shows, instead of a diminution, an increase of nearly 5 per cent., or of 14½ per cent. as compared with the lowest value. Any curve, then, that takes into account all the recorded facts, will differ most materially from that produced by the Commissioners. Indeed, the somewhat anomalous results of the seven censuses of the population, which form the element of the calculation, are such as to show, that we have as yet too few *data* to trace *any* course of probability, even for the next ten or twenty years. No serious and competent man, having his own reputation at stake, would have cared to give prominence to such a mere shot in the dark as the "Population Curve," lithographed by the Commissioners.

Connected with this totally imaginary curve, is a tabular estimate of the consumption of coal for the next four centuries, founded on the extraordinary assumption that, up to the year 1931, the consumption per head will slowly augment, but that from that date until the final exhaustion of the coal in 2231 A.D., it will remain an exactly determined and equal quantity. Really the public should not be called on to read what are called estimates, framed in such a manner as this!

We shall continue the subject in our next.

"HISTORY OF THE GOTHIC REVIVAL."

THERE was once a poet,—we will not here associate his name with his unfulfilled prophecy,—who wrote,—

"——— Doom'd to hide her banish'd head
For ever, Gothic architecture fled."

But did Gothic architecture ever fly this land? Notwithstanding all that has been said about the Revival of Gothic Architecture, we doubt whether it ever really died out. Every one knows there have been, for the last 200 years or more, edifices erected in accordance with the sympathies created by a study of Classic literature; and every one also knows that these do not, altogether, represent the work of those centuries. It would be, indeed, difficult to draw any line that would show so short a period as thirty years in which the most eminent architects did not design in the Gothic style. Inigo Jones has the credit of introducing Palladian architecture into England, but some of his Gothic designs in country mansions are of great interest. Sir Christopher Wren's Gothic was eclipsed by the proficiency he attained in the Classic mode of building, but not only were some of his earliest designs Gothic, but one of the last works of his long life, the steeple of St. Michael's, Cornhill, was also in that style. He died in 1723. In 1747 Walpole wrote to his friend Conway, that he had taken possession of his new purchase, Strawberry Hill. In 1740, Sir Hugh Smithson and the heiress of the ancient Percies were married, and in the succeding years rebuilt a great part of Alnwick Castle in the Gothic style. "They are building at Northumberland House, at Sion, at Stanwick, at Alnwick, and Warkworth Castles," wrote Walpole of them, jeeringly. And when the year 1796 came, the great octagonal tower of Fonthill Abbey, that was to be as high as a cathedral spire, was begun. In 1826 Sir Charles Barry built his church at Brighton; and in 1839 the first stone of the Houses of Parliament was laid. So that, in truth, Gothic and Classic architecture have existed side by side.

Mr. C. L. Eastlake, in the work before us*, gives an account of the events and circumstances that have led to the almost exclusive study of Gothic architecture, so that architects are found who are proud to say that they know nothing about any other, and do not think it worth while to look at an example of any other, even when it comes in their way. Mr. Eastlake shares our impression of the continuity, rather than decay and regeneration, of the Gothic style, by explaining that it is "an attempt to show how the taste for Mediæval architecture, which lingered in England during the two last centuries, has since been encouraged and developed." A large feature of his book is a list of selected examples of Gothic buildings erected between the years 1824 and 1870; but he by no means limits his previous account to this period, for he begins with John Shute, and drops chronologically down past Inigo Jones, Wren, Holt, Batty Langley, Nash, Wyatt, and the rest, till he comes upon the men of our own time. We mention the list of selected examples, however, thus prominently because it appears to us to show the manner and measure of the author's bias, and of his knowledge of his subject. Some one

* "A History of the Gothic Revival." By Charles L Eastlake, Architect. London: Longmans, Green, & Co. 1872.

has said we all work in grooves. Perhaps we do. But it is the duty of the historian to mount some eminence from which he can see the whence and whither of the men in other grooves beyond those immediately on either side of his own. His text is somewhat fragmentary, we must premise, for, perhaps necessarily, it consists of short biographies of architects interspered with notices of their works, only varied by short accounts of buildings interwoven with notices of their architects; still, his views are for the most part well expressed in clear and forcible diction. Between forty and fifty views of buildings, or parts of buildings, illustrate the volume. A large proportion of these edifices belong to the last decade.

Taking up his thread from the hands of John Shute, "paynter and architecte," in the days of Queen Elizabeth, Mr. Eastlake dwells upon the services of antiquaries to Mediæval architecture. It was these worthies who trimmed the lamp of architectural lore, and kept it burning for us to find it alight. Dodsworth, Dugdale, Sir Thomas Herbert, Anthony, and Wood, he quotes as men who recorded the histories of Mediæval buildings; and Grose, Bentham, Hearn, and Gough as men who attempted to illustrate them. Between these two sets of writers he endeavours to insert the influences that brought it about, and notices early works after these were brought to bear. Of course, Walpole's writings are one of the chief influences, just as, a little later, Sir Walter Scott's are believed to have been another. The seat of Lord Dacre, in Essex; Adlestrop Park, Gloucestershire; Beeston Hall, Norfolk; and Cossey Hall, in the same county, are given as early examples of the revival. Lee Priory, "Gothicised" in 1782, by the elder Wyatt; Milton Abbas, in Dorsetshire; Arundel Castle, Sussex; Ashburnham-place, Sussex, designed by Dance; and Swinton Park, Yorkshire, which passed through the hands of James Wyatt, are also cited as belonging to this period. After the works of Grose and his contemporaries, Nash's buildings are mentioned side by side with those of Wyatt. The works of Dance, too, are placed in this fresh category as well as in the first. Donnington Hall, Leicestershire, by Mr. W. Wilkins; Stanley Hall, Shropshire, by Mr. Smalman; and Ditton Park, Somersetshire, by Mr. Atkinson, are referred to as revival works executed in the young days of the present century. Eaton Hall, as designed by Mr. Porden, 1803, is shown in a view. Some of Robert Smirke's works are next slightly mentioned, before a biographical notice of John Britton stops the list. Full credit is accorded to this remarkable man for the great impetus he gave the revival, especially in the amateur world, by his publications. Pugin and Willson furnished more professional aid when they produced their "Specimens of Gothic Architecture;" but Britton's "Beauties" diffused a general association of Mediæval remains with the picturesque. Carter's labours are also dwelt upon. The publication of practical and accurately illustrated books, Mr. Eastlake considers to be the real turning-point of the revival. They furnished precise knowledge of details, which it was easy to reproduce faithfully. Hence the revival speedily passed into a stage where a precedent was required for every arrangement of parts and for every ornamental detail. This fettered period, according to the author, lasted down to 1850. Is it over yet?

Rickman is placed foremost in the list of architects who were also antiquaries. "His works are, perhaps, the finest of that period in which the details of old work were reproduced with accuracy of form," says the writer. He built churches in Bristol, Leeds, Preston, Liverpool, Carlisle, and Canterbury; and mansions in Northumberland, Staffordshire, and near Liverpool, Bristol, and Carlisle. He also built St. George's Church, Birmingham, in the churchyard of which he lies buried. His "Attempt to discriminate the Styles of English Architecture" did more to give precise knowledge than his structural works. Mr. Eastlake observes of this time, "It is a remarkable evidence of the inferior place which Mediæval art still occupied in public estimation, and of the caution necessary in any departure from the much-revered canons of classic taste, that Rickman should have prefaced his book with a formal description of the Five Orders. What possible connexion they can have had with "English Architecture from the Conquest to the Reformation" it is difficult to conceive, and one can only suppose that this first portion of the volume was introduced as a peace-offering to the shade of Vitruvius. No wonder, however, need be expressed, for Rickman's object was, as he states in his preface, to give "a view of the principles of architecture," and, of course, he could not do that without an account of the antique modes from which the modern modes proceeded. Among architects who were young and "rising" in Rickman's day, Shaw, Scoles, Mr. Salvin, and Mr. Poynter are mentioned as likely to have been stimulated by his labours. Mr. Blore is classed as another "pre-Puginesque" architect; and then, dismissing Savage with, of course, qualified praise of his church at Chelsea, we are introduced to Pugin, "whose name marks an epoch in the history of British art." From Pugin we come to Barry and the Houses of Parliament.

The last two great names are disassociated from their surviving contemporaries and immediate successors, by an account of the churches built in conformity with the Act of 1818, for promoting the erection of additional churches. A Royal Commission was appointed to carry the Act into execution, whose reports show the gradual growing preference for Gothic designs very clearly. As at first specified, they are "Roman of the Tuscan order," Grecian Doric, and Gothic; then York and Lancashire take the lead in adhering exclusively to Gothic. A history of the Ecclesiological Society, from its formation as the Cambridge Camden Society to its removal to London, and that of the Oxford Society, serve to increase the distance between the two names we have mentioned and their juniors, and at the same time afford an introduction to some of the prominent members of the profession at the present day. At this point we find ourselves just half-way through the history. "A large proportion of the modern Pointed structures raised between 1840 and 1850 were copied either entirely or in part from old examples, and perhaps it was the best thing that could have happened. For, with a few brilliant exceptions, which it would be invidious to name, no architects of that day could have been trusted to work, as many have since done, in the *spirit* of old art alone, and without borrowing largely from their books and sketches," says Mr. Eastlake. St. Andrew's, Wells-street; its neighbour, All Saints'; St. Stephen's, Westminster; St. Barnabas's, Pimlico; St. Mary Magdalene's, Munster-square, are mentioned in succession as indicating an advance in the prospects of the revival. "St. Mary Magdalene's," continues the writer, "was, perhaps, the last church of any note erected in London before the revival became sensibly, though by no means universally, affected by certain new doctrines of taste in architecture—doctrines which were proclaimed from an unexpected source, and which at one time bade fair to revolutionise and reform those very principles of design that Pugin had recently laid down with so much care." We look through the next few pages, which are devoted to Mr. Butterfield and his works, with curiosity to ascertain more of the "new doctrines of taste," but the explanation is reserved for a fresh chapter. Mr. Ruskin is the preacher of the new faith. It was his extension of the field of precedents south of the Alps, his placement of Pisan Romanesque, Florentine of Giotto's time, Venetian by the side of Early Decorated Gothic, as fit for adoption in this country, that affected the architectural world so remarkably. Previous apologists for the Revival had relied more or less on ecclesiastical sentiment, on historical interest, or on a vague sense of the picturesque for their plea in its favour. It was reserved for the author of the "Stones of Venice," writes Mr. Eastlake, after giving Ruskin a series of hard rubs, "to strike a chord of human sympathy that vibrated through all hearts, and to advocate, independently of considerations which had hitherto only enlisted the sympathy of a few, those principles of Mediæval art whose application should be universal." Good-bye to Pugin, to the Ecclesiologist, and the rest of the recent leaders of the blind. The University Museum, Oxford, is illustrated as an example of the effects of the new teaching. But though a foreign element was thus imported into designs for houses and civil buildings at an early date, ecclesiastical architecture remained impregnable for some time. We quote what may be considered the pith of the writer's creed in his own words. "In 1850 and 1860, however, the list of English architects who devoted themselves more especially to the building and restoration of churches was largely increased. Messrs. E. Christian, J. Clarke, S. S. Teulon, and J. H. Hakewill, were among those who followed, with more or less tendency to individual peculiarities, in the footsteps of Mr. Scott; while a certain number of younger men, including Messrs. G. E. Street, H. Woodyer, W. White, and G. F. Bodley, showed an early inclination to strike out in a new line for themselves." After this Ruskinism began to pale before a new influence, Viollet-le-Duc's publications. Mr. Slater's Digby Mortuary Chapel at Sherborne, Mr. J. F. Bentley's baptistery to the Church of St. Assisi, Notting-hill; Mr. Street's churches of St. James the Less, Westminster, St. Philip and St. James, Oxford, and St. John, Torquay; and Mr. Pearson's Church of St. Peter, Vauxhall, are described in succession as of a French character. A few instances of modifications, versatility, and power of adaptability, as shown in various buildings illustrated:—All Saints' Hospital, Eastbourne; Cloverly Hall, Whitchurch, Shropshire; Leyes Wood, Sussex; Abbey of St. Scholastica, Teignmouth; Knightshayes, near Tiverton; the new buildings at Balliol College, Oxford; Humewood, Wicklow; and the churches of St. Chad and St. Columba, Haggerston, and that of St. Stephen, Hampstead, complete the volume.

One cause of the improved aspect of modern Gothic buildings is the comparative culture of a certain class of workmen now ready and able to assist the architect in the execution of his ideas. Of this our author says but little. Stone-carvers should be especially mentioned; or take the smiths, who can so deal with metals, there spreading them out in floriated hinges, here doubling them into cunning locks, and here again, for the altar-rail, for instance, trailing them into wonderful curves like so much trained foliage, that they become almost the fittest parts of the whole.

Mr. Eastlake's book is chiefly a book of to-day for to-day. It is digressive and recapitulatory, but it is smart, and written with understanding. On the prospects of the revival he is silent, because, he declares at the outset, he could not say any more on the subject than has already been said. The work is damaged by such an amount of overpraise of some of the author's friends as would induce a very erroneous notion of the present position of architecture in this country.

A NEWSPAPER LECTURE TO ARCHITECTS.

ARCHITECTS cannot be too thankful for some words of wisdom and counsel in regard to the Law Courts controversy given them by a daily paper last week. Whilst other publications are lending their columns to elaborate criticism and condemnation of the proposed design, the *Daily News* takes the common-sense and truly-practical view of the question in debate, and reads architects a lesson not only in æsthetics, but on the amenities and moralities of conduct also. Part, at least, of this good advice it becomes almost a public duty to give further currency to:—

"Mr. Street's plans are ready to be used as the guide for the practical builder. Instead of this conclusion to a long and bitter controversy being welcomed by professional men as it is being welcomed by the public, the candid critics of Mr. Street are becoming more active and virulent every day. The battery of carping is now reinforced by the heavy guns brought to bear by Mr. Fergusson in *Macmillan's Magazine*. For Mr. Street, personally and professionally, Mr. Fergusson avows the profoundest respect and admiration. But, like other critics who are sighing over the degeneracy of modern architecture, Mr. Fergusson enters a warm protest against Mr. Street's design. He wishes to see a building erected which shall not recall a bygone age, but shall manifest the spirit of the present time. Practically this means such an edifice as the Post-office, or one of our railway stations. These edifices are types of modern architecture. Yet what would be said if designs of the same character were adopted for the Law Courts? Would not epithets of abuse and denunciation crowd indignant letters from irate architects? The wonder is, that in this long and angry controversy two points have been overlooked. The one is, that there must be an end to talk and writing if any work is to be accomplished; the other is, that fair play should not be denied to an architect even by his brethren. No matter what design be proposed and accepted, professional malcontents will find reason for complaint and remonstrance."

"We hope here be truths." It is always gratifying to receive instruction from those who are competent to give it; and the certainty and *aplomb* with which the writer's views are expressed is the more interesting (may we not add, surprising?) as occurring in a publication which has hitherto appeared somewhat to neglect architecture and architectural criticism. But in this praiseworthy desire to set the thing in its true light, the writer is scarcely quite charitable to the persons whose interference in the matter it deprecates. Mistaken as architectural critics may be,—foolish as their attacks may seem to the more thoroughly educated mind of the writer,—he should have

remembered that even architectural critics, if possessed (however erroneously) with a strong conviction that an unsatisfactory building is going to be erected at immense expense, and that its erection will amount to a throwing away of the finest architectural opportunity of this generation, may think that they have grounds for opposing such erection, quite apart from any feelings which deserve to be called "virulent" or "malevolent." It is instructive, too, to be informed, on such good authority, what the "type of modern architecture" is, and that there is no mean between wild Mediævalism and the New Post-office; but if the latter reference be meant for a fling at Mr. Fergusson, it is fair to remember that that gentleman has publicly and very clearly implied (though not feeling at liberty to make a direct statement) his non-complicity in that design, save in regard to some retouching and shaping.

Again, it would be a little rash to conclude that, because the *Daily News* can give no good reason for admiring Mr. Street's design, those who dislike it are necessarily in the same irrational predicament. We must protest, too, against the wholesale imputation thrown on the non-professional public by the statement that they are ready to "welcome" the termination of the dispute by the adoption of the present design, whatever its defects.

The English public know very little about architecture, certainly, but they (necessarily) know still less about this particular design, of which they have had but small means of judging; and to assert that they do not care what kind of building is put up in the metropolis, provided it answers its practical object, would be to infer that they are even more ignorant and indifferent about art than is really the case.

HAMMER-BEAM ROOFS.

AT the meeting of the Architectural Association, held December 29th, 1871, a paper was read by Mr. W. White, F.S.A., on this subject, suggested for special consideration at a visit by some members of the Association to Eltham Palace a few months ago. The roof of the old hall, standing on walls dislocated by its action, might seem to discredit the principle of hammer-beam construction, if on examination it did not appear an instance of its imperfect application. The roof, although elegant in form and detail, is found to be very faulty compared with numbers of the other remaining specimens of its kind. The walls above the corbels are thrust outwards, and otherwise displaced; the framing of the principals has opened at the ridge, collars,—at most of the joints, in fact, of several of the trusses. The hammer-beams extend very slightly over the walls; the weight of the principal rafters descends within, instead of, as is usual, on the outer faces of the walls; on the depression of the end of the hammer-beams caused by subsidence at joints, rendered more largely by the flatness of the curved braces under the collars, the hammer braces have acted as powerful levers on the walls, submitting naturally to strange changes in their own forms at the same time. A combination of defects being found in this example. Mr. White considered carefully the various theories current as to the principles applied in these roofs. The idea that a system of equipoise was the aim of the constructors, though not unreasonable or entirely unsatisfactory, did not carry sufficient conviction to his mind to prevent him from considering that further investigation was necessary. His idea was, that trussing and tying, the intentional use of timber in a state of tension, were present in these combinations, as well as [the more obvious and generally recognised corbelling and strutting. Dissecting the arrangement of the Westminster Hall roof, he found it probable that the great curved braces, assisted by the under-braces forming the trefoil, acted very frequently as ties, incapable of sagging or straightening, and thus of movement at their extremities. If this could be established,—with pendant pieces, principal rafters, and collar-beams in compression,—there would be found all the necessary parts of a true truss in the modern and customary sense; a construction in which the whole of the principal timbers are either pushed or drawn in the direction of their length. Though not in possession of a large amount of the kind of information required, only to be got by a minute examination of the joints of a number of roofs, in order to detect and appreciate the various halvings, tenoning, and pinning, he thought he had found some confirmatory facts which would lead him to look still further into the matter; he, for his part, could hardly regard with ready acquiescence the statement often made that the course of Gothic roof construction in England "consisted in the substitution of frames of wood for arches and gables of stone, carrying Mediæval science from one material to another, and infusing into carpentry constructive principles that were previously the mason's own." The theory of equipoise, that might be summed up shortly as the balancing of the weight of the upper portion of the roof on the overhanging end of the hammer-beam against the weight of the lower portion on the other end of it pressed down by the principal rafter on the wall,—the top of the wall-piece or pendant posts being a kind of fulcrum,—this theory supposes, almost of necessity, much forgetfulness by the old builders of the resistance of timber to tension. In view of the dignity and harmony with the masonic forms of large, grand architecture attained in the use of solid beams, of large scantlings,—dignity and harmony hardly possible with the use of more meagre scantlings nowadays; he was inclined to look for, what he thought he had found, viz., a not unscientific use of materials, a construction without parade of its triumph, but intentionally containing provision against the remoter as well as the immediate future. In the bulk,—considered as a new construction, we should now say the wasteful bulk,—of these timbers was lodged a reserve of power capable of being turned to new uses when slight failures, and perhaps varying conditions, altered the disposition of the strains. The roof of Westminster Hall, requiring only such maintenance as any building might be expected to call for after standing near upon 500 years, showed practically that the defects so readily seen at Eltham Palace Hall were not derived from the older example, which had within itself the means,—not of self-destruction, but of re-adaptation and of endurance.

The paper was illustrated by sketches and by many diagrams on the black board, which it would be necessary to reproduce in order to give in full what has been outlined above. The "Illustrations by H. Dunnage and C. Laver, of the Palace at Eltham, with Essay, 4to., London 1828," give the jointing of the roof with considerable care; though Mr. White thought he had detected a different treatment in some of the several principals. A discussion followed, and some opinions were expressed as to modern iron roofs, and their comparatively small chance of long endurance; the light rods used to provide against tensile strains have, it was stated, no reserve of strength to make them ready in case of new demands, in heavy gales, and other sudden changes of stress. Setting aside the inevitable, as it would seem, decay that will in no very long time demand the renewal of every iron structure, there are often other operating causes of disturbance, making one look with some satisfaction on the sober, simple construction, and the massive timbers, of the Gothic roofs. The lesson from the Eltham failure,—to give all cantilevers much solid bearing,—and other practical points, were dealt with; and the meeting separated with a vote of thanks to Mr. White, and wishes for a Happy New Year for all from the president.

NEW SYNAGOGUE FOR LIVERPOOL.

A NEW synagogue being required for the old Hebrew congregation, at present in Seel-street, a select competition was decided upon, and six architects were requested to furnish designs. Two of the invited architects declined to compete, and the remaining four accepted the invitation, namely, Messrs. Audsley, of Liverpool; Mr. Collins, of London; Mr. Grayson, of Liverpool; and Mr. Salomons, of Manchester. On Sunday, the 10th ult., by the votes of the free members of the congregation, the designs were reduced to two for further consideration; and ultimately the design by Messrs. W. & G. Audsley was selected to be carried out, and to Mr. Collens was awarded the second premium.

The style of architecture adopted by Messrs. Audsley is Saracenic, treated with freedom. The building is to be executed in brick and stone, richly ornamented. The western front is in five graduated divisions, separated by octagonal and square turrets, terminating in domed canopies. A large doorway in the centre division gives admission to a vestibule, extending the whole width of the building, and flanked with the staircases to the ladies' galleries.

The interior is spacious and lofty, and is divided into nave and aisles by columns and arches. The nave is covered with a vaulted ceiling, and the aisles by sloping panelled ceilings. The interior will be lighted by two orders of windows in the side walls, and a clearstory over the arches of the nave. At the east end of the building is placed the Ark, and behind it the choristers' gallery. The building is to be erected in Prince's-road, near the Church of St. Margaret.

EIGHT PLATES OF COAST SCENERY.

"COAST SCENERY,"—the title seems to smell of the sea. It carries us off from dingy London to some daisy-carpeted southern down or northern link, looking out over bay or frith; from murky mid-winter, with the gas burning at noon, to the early autumn, with pater and mater-familias and their brood, rushing off north, south, east, and west, to the seaside, with that fondness for the water which is part of the nature of the city-pent Englishman.

The title above quoted indicates the presentation work, provided for the current year, for the members of the Art-Union of London, each of whom receives, for his guinea, besides the chance of a valuable prize in the general distribution, this series of impressions of eight steel plates, engraved from drawings by David Cox, Copley Fielding, and Samuel Prout.

It is only necessary to hear these names to be assured of the high quality of the works, and the originals have been worthily interpreted by the burins of Mr. Willmore and his coadjutors.

We believe that that penchant for the sea we have noted will induce a great many people, who are only infants in art, to covet these plates; while the artistic quality of the work will tempt many who do not care much for the sea.

The views, though the same theme runs through them all, embody such different states of weather, &c., that monotony is satisfactorily avoided.

We have the calm summer evening, the setting sun lighting up the "Hulks," after Sam. Prout, which show the graceful sweep of line and careful touching in of detail in which he so delighted.

"Off Teignmouth," we have a short chopping sea, and the dark, driving clouds indicating rougher weather to come.

"At Beaumaris," while the sun still shines on the church and the houses along shore, the sea is getting rough, and the men in the boat are hastily getting down their mainsail.

In "Plymouth Sound," the contrast between the pitchy cloud in the background and the mainsail of the yawl and edge of the fortifications touched by the setting sun is exceedingly effective.

Taken as a whole, we do not think this Society has ever produced an annual work likely to please a larger number of people than the present. We cannot see that anything can be found in it to cavil at.

We notice from the return given in the report lately printed by the council, that in the last distribution the proportion of prizes was rather more than one to every twelve members, and we are mistaken if this year's issue, aided by the greater general prosperity of the country, does not greatly raise the proportion of prizes next April.

At a time like the present, when every institution, from Royalty to Bumbledom, is on its trial, and there is no title so sacred but that some one may be found with boldness enough to question it, it would be well for each one if it could show as good a *raison d'être*, as the Art-Union can, in pointing to such works as those now produced.

The New Library at Lincoln's-Inn.—For some time past the benchers of Lincoln's-inn have determined to appropriate some of the funds in their hands to the construction of a new wing to their library attached to the hall, which has of late years been found inadequate to accommodate the number of students who are in the habit of frequenting it. The design has now being carried out, and an additional building, 50 ft. in extent, is being rapidly constructed on the east side of the original structure, and immediately fronting the side of Vice-Chancellor Malins's Court, which will produce a new building of nearly 110 ft. in length.

AGRICULTURAL PIPE DRAINAGE,

IN CONNEXION WITH ARTERIAL DRAINAGE AND OUTFALLS.*

OUR president, in his opening address, at the commencement of the last session, kindly referred to my paper "On Arterial and Agricultural District Drainage" (vol. i., p. 71, of the Transactions), and expressed a wish that our Institution should be put in possession of the details, both of the execution of pipe drainage and of its effects upon land.

Although the general results of drainage cannot but be well known to most of those to whom this is addressed, I venture to comply with the President's call, and will endeavour to place on record such information as I possess upon the subject.

Arterial drainage and outfalls are, as I have before stated, the leading works in all systems of land drainage, and to them I have paid particular attention as the means by which minor or subterranean drainage can be carried out safely, effectively, and permanently; but without a knowledge of the requirements of pipe drainage, arterial drainage cannot be properly designed and executed.

It may be remembered that in the paper referred to by our President, several methods are described by which arterial drainage can be accomplished, and it is shown that it must be dealt with in a scientific manner, and on an extensive and comprehensive scale, in order to prevent floods, to control the supply of water for all agricultural and social purposes, and to provide for the deep drainage of open ditches, and for pipe drainage.

Those who are familiar with this kind of draining, must have understood that the end of all pipe drainage, let the depths be what they may, is to keep the subsoil water at such a level as not to allow it to rise to the roots of the plants, injuring their growth by its coldness and non-fertilizing properties, and to render the soil above the pipes more friable and open, by making it moderately dry, and causing a circulation of air through it.

A very prevalent opinion existed that the sole use of pipe-drains was to take off to an outlet water which descended upon the surface of the land, as rain, or overflowed it from springs, &c., and with many farmers this idea is still prominent, and they cannot understand that if drains are sunk in clay soils as deep as 4 ft., the drainage water will ever reach them, or the land ever be improved; and if left to themselves, they would not lay the drains deeper than 2 ft. or 2 ft. 6 in.

I have many times tried to convince them what is the source of the water, by showing it to them by trial holes dug in stiff clay, and asking them where they thought it came from, as there was no appearance of its having run down the holes from the surface of the land, or of its having percolated from the sides of the holes. I have shown them that it could only rise from the bottom; but in few instances only have I found that the conviction, even if arrived at, lasted very long. I have also shown them that, after a drain has been dug out to its proper depth, in a few hours water will gradually rise where there was none before.

Many instances are well known in which shallow draining, say from 2 ft. to 2 ft. 6 in., has been taken up and the pipes relaid at depths of 4 ft. and upwards; and it is scarcely possible to believe that in the present day persons can be found who would practise shallow in preference to deep drainings. There have certainly been failures in deep draining, but these have arisen from imperfect work; either the pipes have not been laid in a true line in the drains, or proper attention has not been paid to the fall or inclination, or, more frequently, to the distances from each other at which the drains are laid.

When the soil between the drains has been rendered perfectly permeable, so that rain water sinks to the full depth of the drains, and the subsoil water rises up to their level, the work may be deemed to be satisfactory, as showing that the drains have not been placed too far apart, having regard to the depth in the particular soil which is being treated.

Many persons, being desirous of saving the cost of deep draining, have placed the drains closer together—with shallower depths; but it will be found that this system entails a greater cost and is not so efficient or durable. The table, which will be found under the head of cost, shows the several rates per acre at various depths and widths apart.

The alternative, in case of a defect either from the pipes being laid at an insufficient depth, or too far apart, is to do the work over again or to allow it to remain a lasting disappointment.

I will now proceed to direct your attention to the practical parts of the question, and will first deal with the nature of

Soils.—In laying out drainage the principal difficulty in determining both the depth and width apart of drains, is found in dealing with the different kinds of soils that are met with. The first question that naturally arises is,—what is the geological formation of the locality? and what is the inclination or dip of the strata? From the answers to these questions we are able to infer the existence or absence of permanent springs. Thus, for example, beds of gravel, sand, or other free soil, surrounded or underlaid by beds of clay or other impervious strata, store up large bodies of water, which by slow percolation saturates the surface of the country. So that we can in such cases, by simple means and a small amount of work, free large areas of land from wetness. A knowledge of the soils may be gained by sinking trial holes, exceeding in depth the proposed drainage, or by boring to moderate depths.

The depth from the surface with which it is necessary to deal is really very small as compared with the great masses of material which make up any geological formation; but, nevertheless, it is highly necessary that the engineer should investigate every feature of the soil, the form of the land, its inclinations and produce, in order that he may be able to lay out the work to be executed both efficiently and economically, as well as in the manner best suited for the future improvement of the land. Soils may be classed in two grand divisions—clays and free soils, and it is these we have to deal with; but it must be remembered that each of them admits of several subdivisions, and in both cases rock may be mixed with them.

Depths of Drains.—In all cases in which loans of money are made by the drainage companies under the powers of their Acts, the Inclosure Commissioners, who sanction the charge upon property for the repayment of the loans, require 4 ft. to be the minimum depth of pipe drainage, and experience has fully confirmed the good effects of this rule, after several years' practice. This minimum depth has been fixed after mature deliberation; but it ought not to be imperatively insisted upon in every kind of soil or under all the varying conditions of land.

One constantly meets with the objection that water cannot get down through thick clay, and that it is useless to go so deep as 4 ft.; but our experience teaches us that the soil, having become more loosened and opened by cracks, admits the permeation of water to that depth at least; the very worm-holes permit the water to percolate, and after it has once found its way, by gravity, through the soil, by innumerable small passages, it never ceases, year after year, to continue the same course, until the whole depth, from the causes before cited, namely, the prevention of the capillary attraction upwards of ungenial water, the admission of air by the pipes, and the gradual filtering of rain from above,—is totally changed in character from that of an obdurate and untractable soil to that of a more genial plant-producing one.

The same effects are produced both in arable and pasture lands, but the system to be adopted in draining them is somewhat different. I have hitherto endeavoured to prove that there is a certain minimum depth at which pipe drainage is capable of producing the best results, more particularly when applied to stiff clay.

Distances apart.—I think a general rule might be established to determine, in connexion with the depths, the distances at which the drains should be placed apart from each other, and that is that the width should be a multiple of the depth: for instance, 4-ft. drains may be 16, 20, 24, 21, 32, 36, or 40 ft. apart, the depth being first found at which the level of the water-bed stands beneath the surface. We must then judge, from the nature of the soil, whether it will allow of the water finding its way for half of any of the above widths, to the pipes, always bearing in mind that water will find its way most quickly to a vacuum or the point of least resistance. Take, again, any soil in which it may be found that the water level stands at 5 ft. deep, the multiple may be 40, 45, 50, 55, or 60 ft.; and so with 6-ft. drains, the widths may be 60, 66, 72, 78, 84, or 90 ft. The drainer's judgment and experience will enable him to determine at which of these widths the particular soil which he finds will act best, remembering again that each line of pipes, *i.e.*, each drain, only influences half the distance between it and the next one on either side of it.

The depths of pipe drains can be determined (as we have already seen) by many conditions of the soil and of the water-beds as they are found in the land; but the determination of the widths at which the drains should be laid apart requires much practical knowledge of the nature of different soils, especially as regards the facility with which they allow water to percolate through them, the object being to drain arable land sufficiently, while not overdraining grass land. The expense is lessened considerably when great widths can be attained, even at an additional depth. The rate I have before referred to as the measure of the width would still require the judgment of the drainer to decide what soils will be properly drained by any of those distances apart.

Inclinations or Slopes of Drains.—Owing to the constantly varying slopes of the country, scarcely any rule can be absolutely laid down for the inclinations at which the pipes should be laid. The greatest attention is required in laying the main pipes, into which the smaller branch pipes run. In flat countries they should always be set out with the spirit-level, and the depths from the surface given to the men at every one or two chains along the line. Water will run freely at inclinations of 1 ft. fall to 1,000 ft., 2,000 ft., or 3,000 ft. of length, where the pipes are well laid; but it must be observed that at every junction of a branch pipe the flow will be impeded in the main pipe by the water entering from the branch pipe, sometimes running with considerable velocity. So that as much inclination as possible should be given to the mains, in order that the hydraulic pressure may force the current towards the outlet. The inclinations of the minor or branch pipes must necessarily be controlled by the natural slopes of the ground. In a general system, laid out on a definite plan, it is better to have as few outlets as possible, and I need hardly say that all the minor or branch pipe-drains ought, at their lowest ends, to be united or joined up to one main pipe of such larger dimensions as may be proportioned to, and capable of discharging, the water from a given area of land; these larger pipes being conducted to the lowest extremity of the area to be drained, and there discharged into an open drain or stream.

The cost of long lengths of large pipes, increasing in size as they go, raises a question as to the expediency of using them, but the work is easier to maintain than when a large number of outlets is used.

I have frequently found it most useful, in laying both large and small pipes, where the bottoms of drains are in soft, boggy, or sandy soils, and there is every probability of the pipes sinking or getting out of their proper inclination, to lay them on strips of wood cut out of three planks of elm, or other timber as durable in water, from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. thick. The cost is very trifling, and is as nothing compared to that of having to re-open and relay the drains, while doubt of the success of the work is thereby to a great extent avoided.

Outlets.—The pipe at the outlet or head should be raised above the ditch or stream, which should be cleared, and, if required, deepened for some distance, so as to ensure the water not being backed up into the pipes. I have adopted self-acting iron traps at the outlets, in cases where the tide has occasionally risen against them; but the chief object was to prevent the mud, of which there is generally a large quantity in tidal waters, from being taken up the pipes, and there left to deposit itself. All outlets should be protected by brick or stonework, set in mortar or cement, the foundations being sunk from 1 ft. to 2 ft. under the bottom of the ditch or stream, which should be paved to recive the water from the pipe.

Referring again to the depths of the drains, it is frequently necessary to lay the main drains 6 ft., 7 ft., 8 ft., or even 10 ft. deep in places, in order to drain land to an outfall, which lies at too low a level to allow of the ordinary depths being employed.

Sizes of Pipes for certain Areas.—In all engineering questions relating to the flow of water through pipes, there are fixed rules for ascertaining the quantity discharged, when running full, according to the size of the pipes, their

* By Mr. Richard Boxall Grantham, C.E. Read at the Ordinary General Meeting of the Institution of Surveyors, December 18th, 1871, Mr. Edmund James Smith (member) in the chair.

inclinations, and head or pressure above the point of entrance of the water into the pipe. But in the case of pipes in land drainage, which are not as a continuous tube, no rule can be applied to measure the quantity that flows, so as to adapt the sizes of the pipes to the particular cases in which they are employed, because the quantity of water which is taken in is very uncertain, and in some cases most irregular, and the inclinations vary at every change of surface, so that in some parts of the same pipe the velocity is very great, and at others very small. It is seldom found that the same amount of water is discharged out of any two pipes in the same field, and this is frequently the case even when they are side by side. The quantity of water varies very considerably under the different conditions of soils in which the pipes are laid; for instance, in free soils with springs, and in times of much rain, which penetrates quickly, all the pipes will run full, and likewise, at times, in free soils with rain alone. In free soils the percolation of water in suspension through the soil being slow, and rain water also descending slowly, the pipes are not overcharged; besides, in such soils, the pipes are at more frequent intervals, and would, if the water came as rapidly as from the free soils, discharge it more easily. In the early period of land drainage, pipes of 1 in. diameter were commonly used, but they were not continued for any length of time, and they were seldom if ever sunk in the ground deeper than 2 ft. or 2 ft. 6 in. Pipes of 1½-in. diameter succeed them, and, more recently, 2-in. pipes have been almost universally adopted for the branch drains. There was also the horse-shoe pipe, laid on the tile as a sole; but these have totally failed and become obsolete. The adoption of 2-in. pipes, the area of which is 3·14 square inches, has been a great improvement, inasmuch as, besides being in nearly all cases large enough for the water to run out, they allow the air to pass up when they are not full, as before described, and thus ameliorate the condition of the soil above and around them. No single rule can apply as to size; but, as regards the sizes of main pipes, into which the minor pipes discharge, some attention is required to regulate them, and, if possible, their inclinations. In these cases, however, it would be impossible to fix the sizes by the ordinary rules of engineering; so that it is necessary to resort to experience, aided by a few approximations which serve somewhat as guides. These main pipes vary from 3 in. up to 12 in., and 2 ft. in diameter, in proportion to the area which will discharge into them, and the inclinations at which they are laid. The following table gives the approximate sizes of pipes for soils of maximum density and lightness :—

Diameter of Pipe.	Area of Pipe.	Area Drained.	
		In Clay Soils	In Free Soils.
Inches.	Square Inches.	Acres.	Acres.
3	7·66	6	4 to 5
4	12·56	9	6 ,, 7
5	19·50	16	13 ,, 14
6	28·08	25	20 ,, 22
7	38·22	35	30
8	49·92	46	40
9	63·18	60	50
10	78·00	75	60
11	94·38	91	70
12	112·38	109	80

The several degrees of porosity of soils between the extremes, must be treated as experience may dictate, and the inclination at which the drains are laid will affect the question: for instance, a rapid fall of the branch pipes into the main pipe would necessarily require that the latter should be increased in size; but a slow discharge does not require larger pipes than those given in the table.

Directions of Drains.—In ordinary-sized fields it is convenient, and in no way interferes with the efficiency of pipe-drainage, to lay out the minor drains in each field exclusively for that field, but to connect them with a main drain, which may be laid so as to take the water from several fields to a distant outlet. In uniform soils, whether dense or free, the usual practice is to lay drains parallel to each other, on what is commonly called the *gridiron system*. In stiff clays, where the drains are more frequent, this plan is undoubtedly to be preferred, for the reasons before stated,—that the water may be equally drawn off from all parts, and the land uniformly aërated. In free soils, such as gravel, sand, and the like, where there are springs which rise to the surface, and are visibly saturating large or small areas, the drains may be run in such directions as will enable them to tap those places, and ultimately to drain a larger area.

Deep as drainage may be laid, it is never altogether free from the possibility of being put out of order by the roots of trees or of certain kinds of crops which may penetrate the drains, and form a hindrance to the free passage of the water through them. The roots of the elm, ash, willow, and other trees are known to enter the pipes, and even pass through the ground for several yards to reach them, as if they were attracted by the moisture and air which they find in the pipes, and by the nourishment afforded them there. To obviate this difficulty, it is advisable, where it occurs or is apprehended, to use socket-pipes jointed with cement, or to lay the pipes as far as possible from the trees. I have found that embedding the pipes in lime, mortar, or concrete has prevented them from being choked, although close to trees which it was impossible to avoid, and has kept them clear for some years. The roots of some crops, such as wheat, turnips, carrots, mangold, &c., if they should penetrate the pipes, die away when the crops are removed, and are frequently washed out of the mouths of the drains by the strong flow of water through them. Other substances give the drainer a vast amount of trouble in obstructing pipes. Ochreous water, depositing oxide of iron, is a common source of obstruction. It appears to harden and consolidate as it receives air through the pipes, and ultimately chokes them. I have found it best to get at the source of the spring or springs, and conduct the water away by large pipes independent of the general system. Confervæ and parasitic plants will also get into the pipes, grow, and ultimately stop the flow of water through them. Another source of trouble is the percolation of sand into the pipes, which necessitates patience and care in taking them up, frequently after being first laid and relaid, until all the water has run out of the bed, and then laying them in straw and on strips of wood.

Fen land draining is one of those exceptional cases where great skill and attention are required. In an instance with which I am acquainted, some fen pasture-land that was letting at from 2*l.* to 3*l.* an acre, was drained and broken up, but it produced scarcely any crops. It was too closely drained, and some time elapsed before it even partially recovered from the effects.

Mr. Clutton, in his paper on "The Cost of Conversion of Forest and Woodland into Cultivated Land," having alluded to the drainage which was carried out at Hainault and Shrob Walk, has drawn my attention to draining under those circumstances. I will just state that in the former case, although some pains were taken to grub up the roots of the oaks and hornbeams with the trees, we constantly met with them in the drains, and they were either taken out or cut through. Some of the roots in the light soils, in the southern part of the forest, were found deep in the ground.

At Shrob Walk, where the soil was almost entirely a uniformly stiff clay, we had not so much difficulty arising from this source, but in both cases the cost of draining was thereby increased, and this applies also to the land containing briars and underwood only. Could the draining have been delayed for a year or two, the roots would have nearly all rotted off.

Draining through rocky ground is very expensive, but, as in most rocks water either lies above the beds or below them, it frequently taps a large area of land, and where the rock projects out on the face of a sloping country, which it frequently does, it holds up the water in the land above it, so that one or two drains carried through it let free a large quantity of water, and the land will be permanently drained. The most obdurate rocks are those found in the high land of the old red sandstone, the lias, those of the coal measures, and others. This stone may be used for the farms or public roads, and this will very much relieve the expense of getting it out of the drains.

Cost.—The most material consideration resulting from all the experience of soils, depths, widths apart, inclinations, directions of drains, and sizes of pipes, is the minimum cost at which the work can be done, so as to obtain the best result in permanently improving the land. This must vary in different parts of the kingdom, according to the soil, the rate and quality of the labour for this kind of work, the seasons, and the price, quality, and cost of carriage of the pipes. Sometimes the cheapness of one or two of these items will counteract the dearness of the others, so that something like an average may be arrived at.

I have kept a register for some years past, which shows the rate of cost per acre and per rod of drainage works, executed under my supervision in localities distributed over a large part of the kingdom. This summary includes about 120 distinct works, representing every variety of soil and every degree of difficulty, ranging in quantity from 10 acres to 1,900 acres. The rates of cost extend from 3*l.* 6s. 8d. to 9*l.* 5s. 4d. per acre, and from 14 pence to 36 pence per rod, whilst the number of rods of drains to the acre varies from 39 to 115. The following are the results shown by this record up to the end of last season :—

Total Quantity Drained.	Total Number of Rods Cut.	Rods of Drains per Acre.	Total Cost.	Cost per Acre.	Cost per Rod.
A. R. P.	No.	No.	£. s. d.	£. s. d.	d.
15,006 2 16	1,136,219	75·7	90,284 12 10	6 0 4	19·70

It should be stated that these figures include the large and exceptional work of drainage of disafforested land at Hainault, the 1,900 acres of which cost upwards of 8*l.* per acre, and averaged about 105 rods of drains to the acre, the widths apart varying from 18 ft. to 60 ft. according to soil.

Where the rate per rod is high, the rate per acre may be low, and *vice versâ*. This necessarily arises from the nature of the soils, the prices of the pipes, and the widths of the drains apart, with other varying circumstances before referred to.

I have arranged the following table, which gives the general prices of work under the various conditions :—

Ordinary Cost of Cutting and Filling Minor Drains, using 2-in. Pipes at, say, 25s. per 1,000.

Depth.	Rate per Rod for Cutting and Filling.	Rate per Rod for Pipes.	Total.
	s. d.	s. d.	s. d.
4 feet	0 8	0 5	1 1
5 ,,	0 10	0 5	1 3
6 ,,	1 1	0 5	1 6

Cost of Main Pipes per Rod.

Size.	Price per 1,000.	Rate per Rod.
	£. s. d.	s. d.
3 in.	1 15 0	0 7
4 ,,	3 0 0	1 0
5 ,,	4 10 0	1 6
6 ,,	6 0 0	2 0
7 ,,	8 0 0	2 8
8 ,,	10 0 0	3 4

Cost per Acre of Cutting and Filling, including Pipes at various Depths, any Distances apart.

Depth of Drains.	Distances apart.	Cost per Acre.
Feet.	Feet.	£. s. d.
4	16	8 18 9
,,	20	7 3 0
,,	24	5 19 2
,,	28	5 1 10
,,	32	4 9 4
,,	36	3 19 5
,,	40	3 11 6
,,	44	3 5 0
,,	48	2 19 7
5	30	5 10 0
,,	35	4 14 4
,,	40	4 2 6
,,	45	3 13 4
,,	50	3 6 3
,,	60	2 15 0
,,	65	2 11 3
6	42	4 14 6
,,	48	4 2 6
,,	54	3 13 6
,,	60	3 6 0
,,	66	3 0 0
,,	72	2 14 9
,,	78	2 11 0

To these rates should be added from 12s. to 15s. per acre for turfing, building up outlet heads, deepening and widening outfall drains, foreman's wages, superintendence, &c.

The cost of cutting through rock must always be exceptional, and no rule can be given for that kind of work.

Duration of Pipe Drainage.—Another question which deserves much consideration and attention is that of the duration of pipe drainage, and its continuously effective working. These properties depend almost entirely on the manufacture of the pipes, which are buried deep, and cannot be got at to be repaired without some expense, and which, when out of order, are

always liable to be neglected or repaired in an inefficient manner.

Where all the work has been well done, drainage executed thirty years ago is known to be in an efficient condition, although pipes were not then so deeply laid as they are now, and it may be fully expected that the deeper they are laid the less liable they will be to be injured or disturbed: a strong argument in favour of deep draining.

In conclusion, I have to make a few general observations on points which ought to be attended to in laying out and executing this kind of drainage, whether on a large or small scale. Like many other matters, drainage, when dealt with wholesale, can be done at less cost, and more efficiently. When an estate is to be drained, a comprehensive scheme should be at first determined upon, and taken in hand as a whole, whether the work is to be carried out all at once or to be extended over two or more seasons.

As to the manufacture of pipes—great variety exists in the cost, the localities in which they are manufactured, and in the quality. There is of late years a great improvement in the make of them. The cost in the yard, in different parts of the country, varies from 14s. to 25s. per 1,000, for 2-in. pipes, the 78 per cent. of difference partly arising from the quantity a manufacturer can make, owing to the facilities he has, and the nature of the clay, and partly from the price of fuel, or the amount of capital he can command. The carriage frequently very much increases the expense,—adding, in some cases, 50 per cent. to the first cost. The larger sized pipes increase in cost in greater ratio than the difference of the sizes, and the carriage also is greater in proportion, owing to increased thickness.

On an estate, where a large work is to be carried out, and where, probably, bricks are required for farm buildings and cottages, it is much more convenient to establish a pipe and brick yard upon it, provided proper clay can be procured, and a navigation or a railway affords the means of bringing coals.

Another important matter, upon which the successful result of pipe drainage mainly depends, is the superintendence. You want a man who not only can lay the pipes in a trench, but he must be of strict integrity, seeing that the trench is cut to fit the size of pipe, and with a proper fall, so that the waters shall always run clear away, and that every pipe is laid perfectly true in line, and so joined to its neighbour that neither loses any of its area by the ends not fitting truly and closely to each other. The foreman should watch closely that no bad (that is, unburnt) pipes are laid, as they will inevitably perish in time, and destroy the whole work. Men who are trained to the work become so skilled in laying out the direction of the drains that they can judge with tolerable accuracy the amount of fall in any distance, and the inclination at which the pipes should be laid. Of course in very flat countries the spirit-level must be brought to their assistance. The men who become the best skilled in digging the trenches make good wages; and I have always found that the workman who makes the best work earns the most money, and does the work most quickly. I would rather employ men who earn from 20s. to 23s. per week than those who can earn only 15s. or 16s.; but, of course, in a gang, all the men are not required for the most difficult and skilful part of the work. Farm bailiffs, who have other work to attend to, ought never to be employed to superintend drainage, as it requires the whole attention of the foreman to conduct a work cheaply and securely, and it is only men who are specially trained who can properly superintend it. There should not be larger bodies of men than from thirty to forty under one man's charge.

Another practice should be condemned by all who are interested in the success of these works, and that is that of giving pipes to tenants to lay themselves. Such work is never well done, and is just so much money thrown away.

All the drains ought to be laid down on the estate or other map so as to be referred to afterwards to find the outlets, and in case of extension to be able to add to the original work.

There is another matter connected with land drainage which must claim serious attention, and requires more than ordinary skill and judgment, *i.e.*, under-draining land to be made into sewage farms. I drained Breton's farm at Romford, and after two years' working, it has answered well,—that is, the effluent water is, I believe, superior to that coming from any other sewage farm. It is in a porous soil, and so is that near Merthyr Tydvil, which was drained by Mr. Bailey Denton. We have not yet had sufficient experience of the best mode of treating such cases, especially in clay, loamy, or rocky lands.

I hope to be able to give the Institution some information hereafter on this branch of the subject.

A long discussion ensued, which was adjourned to the next meeting, Monday, January 15th.

EXPERIMENTS ON THE STRENGTH OF MATERIALS.

DOULTING FREESTONE.

THE result of some experiments on Doulting Freestone, from the quarries of Mr. C. Trask, have been made by Mr. Kirkaldy. It may be useful to record the results in our pages. The experiments were tried on eight beds and heights of stone to ascertain the resistance to a gradually increased thrusting stress, each stone being bedded against pieces of pine ¼ in. thick:—

Tested "against" the Bed.

6·04 × 6·05 = 36·54 super., height 6 in.—Cracked slightly with 75,240 lb., or 2,097 lb. per square inch. Crushed: 89,180 lb., or 2,441 lb. per square inch.

6·04 × 6·02 = 36·36 super., height 12 in.—Crushed: 79,620 lb., or 2,189 lb. per square inch.

6·03 × 6·02 = 36·30 super., height 18 in.—Crushed: 70,870 lb., or 1,952 lb. per square inch.

5·98 × 6·00 = 35·88 super., height 24 in.—Cracked slightly with 62,270 lb., or 1,735 lb. per square inch. Crushed: 65,890 lb., or 1,836 lb. per square inch.

Tested "on" the Bed.

5·98 × 6·00 = 35·88 super., height 6 in.—Crushed: 89,380 lb., or 2,490 lb. per square inch.

6·07 × 6·08 = 36·91 super., height 12 in.—Cracked slightly with 69,240 lb., or 1,876 lb. per square inch. Crushed: 83,620 lb., or 2,265 lb. per square inch.

6·08 × 604 = 36·72 super., height 18 in.—Cracked slightly with 72,770 lb., or 1,982 lb. per square inch. Crushed: 79,850 lb., or 2,174 lb. per square inch.

6·04 × 6·06 = 36·60 super., height 24 in.—Crushed: 77,040 lb., or 2,103 lb. per square inch.

SACRISTIES.

ST. GEREON'S CHURCH, COLOGNE.

ANY person who has compared the arrangement of our ancient English churches with the same class of building on the Continent, must have noticed the fact, that while on the Continent the sacristy always forms an important feature, and is frequently of large size, in England it is nearly always a small (not to say mean) building, and in most of our churches does not exist at all. Now, there is considerable difficulty in accounting for this difference in ecclesiastical arrangement, because the varieties of rubrics and rite were not sufficient to explain such a discrepancy. Some have supposed that in England the sacristy was formed by portions of the church being screened off for that purpose, and probably this was the case in some of our village churches, where to this day the lower part of the tower is still used for that purpose, though of course this most inconvenient arrangement could not have existed in the larger and more important churches. It has also been suggested that the great length noticeable in the chancels of some of our churches is to be accounted for by the fact that the altar did not stand against the east wall, but was placed one bay from the east end, and the space behind it was used as a sacristy: and there is much to favour this supposition; for, in the first place, where ancient sacristies *do* exist in this country, they are very frequently found built out at the east end of the church; secondly, the general arrangement of the great reredoses in our cathedrals and abbey churches, with doorways on either side of the altar, would seem to suggest such position for the sacristy; and it is quite evident that at Meopham, in Kent, and Tideswell, in Derbyshire, the sacristy was formed in the eastern bay of the chancel, which was cut off by a stone reredos, marks of which still exist in both churches. Even, however, if this were the case, the sacristies so formed must have been exceedingly small. At first sight, this smallness of the sacristy would seem to point to great simplicity of rubric; but this is contradicted by the great size of the chancels in most of our churches, and their elaborate fittings, even if there were no historical evidence to prove that before the Reformation the English ritual was gorgeous in the extreme. Some people have asserted that in England, as a rule, the priest vested at the altar, and that the "parvise" was used for keeping the vestments, sacred vessels, &c.; but we can find no authority whatever for this assertion, and even supposing it to have been true that the *priest* vested at the altar, it is scarcely possible to conceive that his assistants did the same thing, or that the choir took off their cloaks and put on their cassocks and surplices in the chancel of the church. We confess that we are still at a loss to account for this peculiarity in English ecclesiology, and the suggestions which have from time to time been made upon the subject seem only to involve it in a deeper mystery.

Of the sacristies which do exist in this country, perhaps the most perfect are those of York Minster. However, even these are small and unpretending, and seem quite out of keeping with such an immense cathedral. The most beautiful buildings of this description existing in this country, are the sacristies of Wimborne Minster, Dorset, and Luton Church, Bedfordshire. The latter is a singularly beautiful example, and although rather small, is a costly building. It is vaulted with stone, and the roof supported upon a central column. Two sacristies exist at St. Peter's, Mancroft, Norwich, one above the other; both are at the east end, and occupy the usual position of the lady-chapel in large churches. Similar sacristies exist at the churches of Lavenham, St. Peter-per-Mountergate, Norwich, and Allhallows Church, Barking. The sacristy of the latter was rebuilt during the last century, but occupies the site of the ancient one. Good examples of ancient sacristies are to be seen at the churches at Margate, Rotherham, Hillesdon, and St. Mary, Oxford.

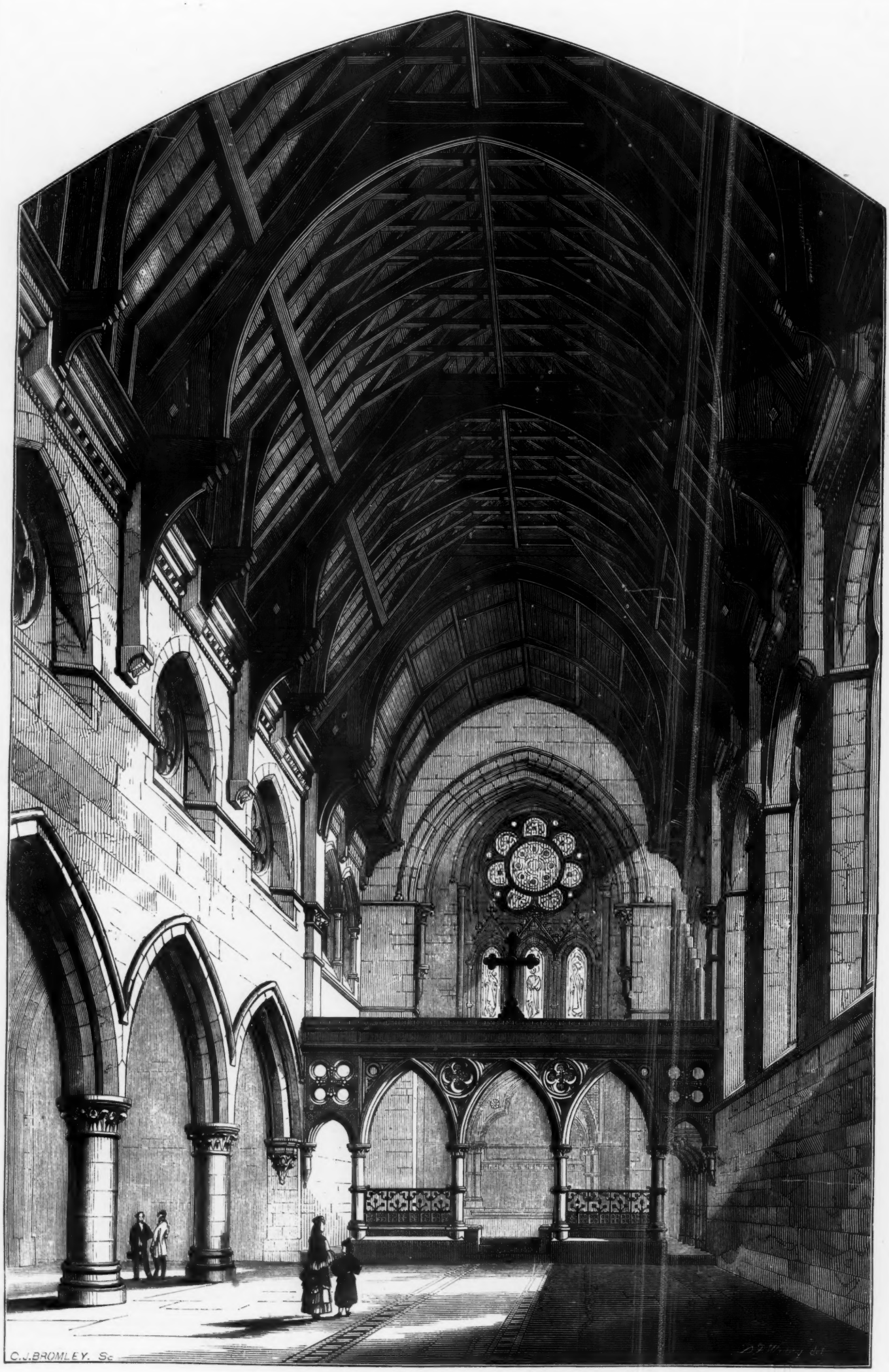
On the Continent, and especially in Germany and Italy, the sacristy is always an important feature. The example we give from the Church of St. Gereon, in Cologne, is a noble example, and is interesting from the fact of its containing a considerable amount of its ancient furniture; for instance, the altar, several aumbrys, the sink, &c. The rest of the furniture, though of the seventeenth century, is costly and handsome. The windows are filled with superb ancient glass, and, as will be seen from our engraving, the whole building is of a rich but very pure fourteenth-century style, singularly English in appearance, and quite free from that wiryness which is the defect of so many German buildings of this date.

Remarkably beautiful examples are the sacristies of the Cathedral of Cologne; they are internally the most beautiful portions of the whole building, especially the outer sacristy, which consists of a square building, with its vaulting supported upon a slender and singularly graceful central column; the windows are of four lights. Against the east wall is an ancient altar with well-moulded "mensa" and base; and against the north wall is a most superb *sacraments haüslein*, a perfect forest of niches and pinnacles. The floor of this beautiful apartment is composed of small black and white tesseræ arranged in patterns, and is a most valuable example of a fourteenth-century pavement.

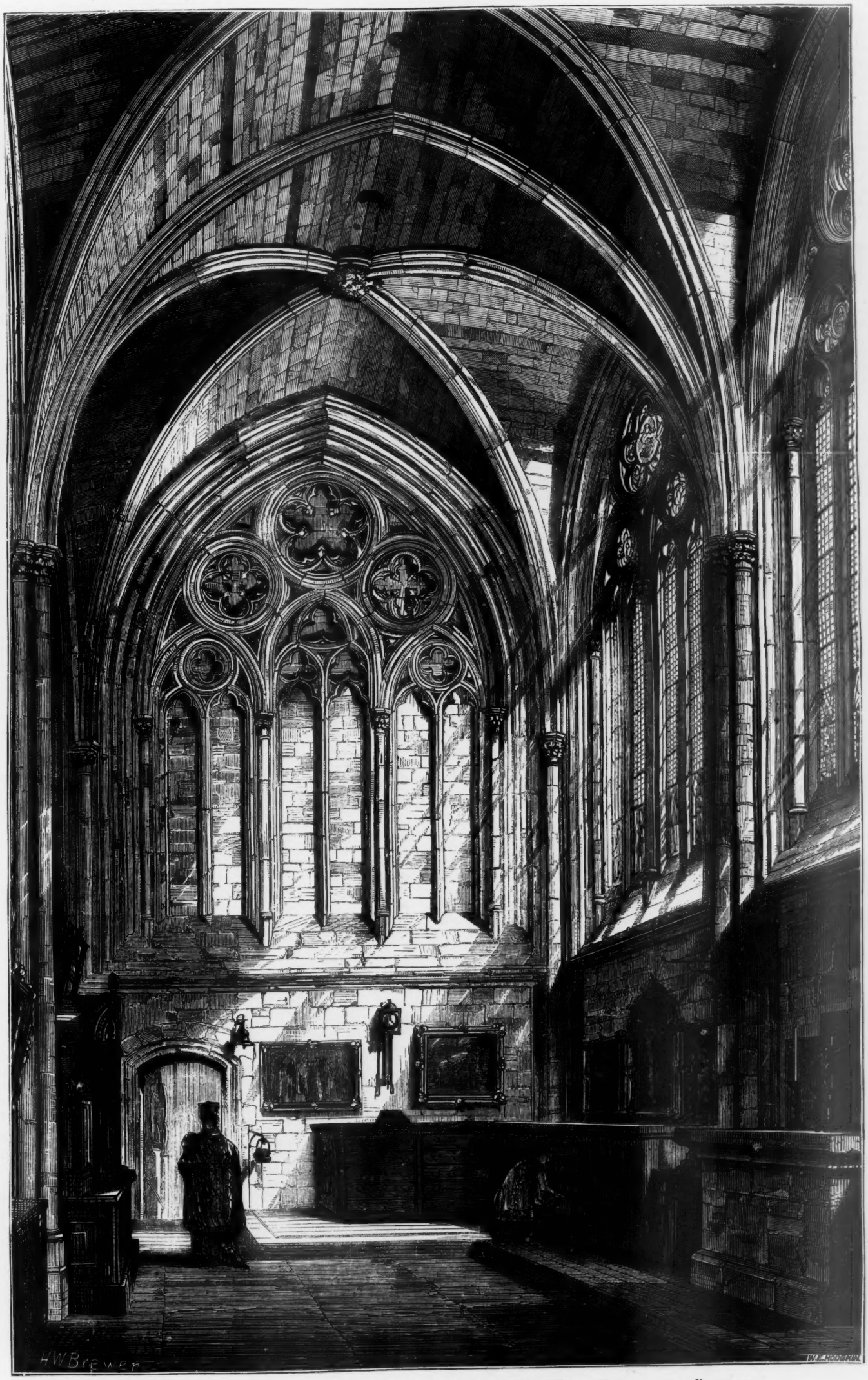
The sacristy of the Cathedral of Freising is perhaps one of the noblest in existence. It is divided into a nave and aisles of equal width, five bays long, by two rows of octagonal columns of red marble. The whole is beautifully vaulted in stone. At the east end are the altars, over which are ancient pictures of great beauty. The whole building was originally decorated in colour, portions of which can still be seen.

The sacristy of the cathedral at Hildesheim is of a similar plan, only its axis is from north to south, and not from east to west. It is a plainer building, and not so large as that of Freising. It contains one altar dedicated to St. Thomas of Canterbury.

The sacristies of the cathedrals of Ratisbon, Freiburg-in-Breisgau, Aix-la-Chapelle, and Münster, are all interesting buildings; and those of the churches of Oberwesel (which contains its ancient altar and reredos); St. Mary's, Würzburg; Holy Cross, Schwabisch Gmund; and very many others, are excellent examples of the care which ancient German architects expended upon this portion of their ecclesiastical edifices.



ST. JOHN'S CHURCH, BATH.——MR. ARTHUR BLOMFIELD, ARCHITECT.



THE SACRISTY OF ST. GEREON'S CHURCH, COLOGNE.——FOURTEENTH CENTURY.

CHURCH OF ST. JOHN THE BAPTIST, BATHWICK, BATH.

THIS is not an entirely new church. The original building, erected a few years since, consisted of a nave and chancel, with a transept, organ-chamber, and a small tower and spire, forming a porch at the north-west angle. The congregation having far outgrown the accommodation, an extensive enlargement became necessary. Mr. Blomfield was called in, and prepared a design for adding to it as much as the limited site would permit. The plan consisted of a large and lofty nave (the existing one becoming the north aisle), a south aisle and porch, a large organ transept, and priests' and choir vestries. This scheme had to be very considerably modified, and the south aisle abandoned, on account of the expense. The present plan has the same features, with the exception of the north aisle, but carried out in a plainer manner.

As there was considerable difficulty in adding a nave of satisfactory proportions in the usual way (owing to the limit of the site westward), the main roof is carried unbroken from east to west, only a sacrarium, 15 ft. deep, being cut off by a lofty arch at the east end. The choir is taken out of the nave area, and surrounded by a low stone septum and metal screen, and towards the west there is a stone rood-screen, which serves to divide the choir from the nave, and to receive the thrust of the old chancel arch. The division is further marked by a pair of coupled principals in the roof.

The roof over the choir and sacrarium is simply decorated in colour; and a considerable amount of stained glass, including the east window and the side windows in the chancel, has been presented by various donors. The reredos consists of a very effective mosaic picture of the Nativity, set under a richly-moulded arch, which forms part of the architectural design of the east end. This, as well as the decorative painting and the stained glass, was executed by Messrs. Bell & Almond. The altar and choir-stalls, in oak, were executed by Mr. Bates, of Stevenage, Herts. The carving was done by Mr. Earp, who also executed the pulpit. The metal-work is by Mr. Shrivell. The contractor was Mr. G. C. Mann, of Bathwick. The organ, which is a fine instrument, though yet unfinished, is an electric one, by Messrs. Bryceson, the organist sitting behind the choir-stalls on the opposite side to the organ.

The general dimensions of the building are:—Nave and choir, 96 ft. 6 in. long, 29 ft. 6 in. wide, 35 ft. high to plate, 60 ft. to ridge; sacrarium, 15 ft. long, 21 ft. wide.

The total cost was under 5,000*l.*

CHURCH DECORATION AT WEYMOUTH.

THE parish church of St. Mary's, Melcombe Regis, which is a structure devoid of the marked features of ecclesiastical architecture, has this year received a Christmas decoration deserving of a passing notice. The church, which furnishes some 2,000 sittings, is an elongated square, with galleries on the north-west and south sides—the gallery front being continuous, and divided by plain stone columns into spaces of about 12 ft. each. The entire sweep of the gallery front is covered with a series of needlework designs, in which the utterance of the shepherds, "Glory to God in the highest, on earth peace, goodwill toward men," is shown by church-text characters of about 13 in. each. The letters are formed principally of laurel-leaves and scarlet cloth on a white ground. The word "God," which occupies one of the gallery openings, is rendered by letters of white swan's-down on scalloped squares of scarlet cloth, the terminals of this design, as well as that of some others, being diapered with strips of scarlet cloth fastened at the points of intersection with rossettes of ivy leaves and swan's-down. The other principal words are composed of scarlet cloth, some with trimmings of swan's-down, each design having a border at top and bottom formed of single laurel-leaves, relieved in each half-lozenge by diamond-shaped pieces of scarlet cloth and wool, and forming a continuous zigzag pattern throughout the sweep. The gallery spaces on the east end have each the word "Allelulia," shown in white letters on a scarlet ground, with ornamental trimmings. On the eastern wall is a large painting about 30 ft. square, besides being at the top of an elliptical shape, following the line of the ceiling. Fitted to the upper sweep of the frame, a roll, scalloped on the upper edge, and about 45 ft. long, exhibits the text, "A Saviour which is Christ the Lord," in white, on a ground of scarlet cloth. The letters, which are decorated with ivy-leaves and yew, form a continuous scroll. The credit of the design is due to Mr. G. R. Crickmay, architect, who is this year one of the churchwardens of St. Mary's parish, and it has been carried out by a small body of honorary needlewomen, who have shown precision and taste in the execution of the work.

ON THE PREVENTION OF NOXIOUS SEWAGE EMANATIONS.

THE writer of the article with the above heading, in last week's *Builder*, advocates what is no other than a mischievous fallacy. He says that "there is no smell from self-cleansing channels; . . . . that the only need of traps and ventilators is to guard against accidental stoppages;" and that, "as a rule, where there is smell from the drains or the sewers there is stagnant deposit." Now, it is a fact that "good tubular sewers or drains . . . . so constructed . . . . as to be self-cleansing, and to be always clear of deposit," give out noxious emanations the same as sewers and drains of deposit. The writer seems to think that, as "fresh human excreta is innocuous," and that as "the period of noxious decomposition begins usually not later than about four days in the sewer-tank," it is removed in self-cleansing sewers before decomposition takes place and foul gases are evolved from it. But this is not the case. Those who have taken particular notice of sewage flowing in sewers will tell him that little or no excreta is ever seen towards the outer end, and not even in those from separate streets. The water, and its motion or agitation in the sewers, quickly dissolve the excreta, whose gaseous constituents then enter into chemical combination with the water; then, the mass being foul, and warmer than the air which occupies the large rainfall space above it, the agitation of it by the flow, together with its warmth, and exposure to the less temperature of the overlying air, causes it at once to emit noxious gases. There is an old saying, that "the more you stir a certain compound the worse it smells." It is even so by the motion of the sewage through the sewers. The writer's fallacies, such as the above, and his theoretical interferences with the practical details of the necessary works, have retarded, and will, I fear, continue to retard, sanitary progress.

The lightest and most abundant of the gases which emanate from the sewage—namely, sulphuretted hydrogen,—flows up the drains to the highest points under the water-traps to the sinks and closets, through which it escapes, not only every time water is discharged down them, but when the pressure of the pent-up gases on the outlet sides of the traps is greater than the pressure of the external air on their inlet sides. The above, then, is what naturally takes place in every sewage-channel, whether it be self-cleansing or of deposit; and hence the necessity to "make a vent therefrom upwarde . . . . and carrie the same to a convenient heighth; for so the offensive ayre as fast as it riseth hath issue, and stayeth not in the passage."*

The writer says truly that "the most effectual course is not to combat with the gases when produced, but to prevent their production." No one has ever prevented their production in self-cleansing channels, and cannot do so. "Good tubular sewers or drains . . . . so constructed . . . . as to be self-cleansing, and to be always clear of deposit," are as much "the bulbs of retorts, and the house-drains as the necks, conveying the" gases evolved from the flowing sewage "into the houses," as are the sewers and drains of deposit. The "bulbs," in fact, are in both the large air-spaces which are provided for the rainfall above the sewage. The nearest approach to the desideratum of preventing the production of the gases would be to reduce the capacity of the "bulbs" to a minimum,—that is, to make the sizes of the sewage channels proportionate to the maximum flow of the sewage. By doing this, noxious emanations from the sewage would be greatly reduced, or almost prevented. But this would involve the adoption of the "separate system of drainage," which consists in carrying off the sewage by one set of drains, and the rainfall by another set. This system, after every other has been blundered through, will be adopted. Complete ventilation of the main drains could be effected by revolving fans placed in them at suitable situations, and *driven by the force of the sewage currents*. The noxious gases as they emanate from the sewage would be drawn into and driven up the ventilating pipes, which would be connected with the fans, and carried above the altitude of the houses.

JOHN PHILLIPS.

* "How to Take Away the Offence of Noisome Vaults."—"Make the vent thereof upwarde as large or larger than the tunnell downward, and carrie the same up to a convenient heighth, for so the offensive ayre as it riseth hath issue and stayeth not in the passage."—*Sir Hugh Platt, "The Jewell House of Art and Nature,* 1594." Thus was drain-ventilation, about which there has lately been much clamour, publicly proposed 278 years ago.—J. P.

NOTES FROM AMERICA.

I MUST preface my letter with a description of railway travelling in America, and confess that Great Britain is a long way behind the times. 1st. In regard to luggage. When a traveller arrives at a depôt, his luggage is taken from him, a brass ticket given him, and a corresponding ticket attached to his luggage, the station marked on the same: so, when at the end of his journey, he hands the ticket, and receives his luggage. Again, the cars (all railway-carriages are called cars) are far more convenient: a smoking-car, palace-car (fitted up boudoir fashion), and sleeping-cars, to each; there are a filter for drinking-water, and closets for males and females.

The New York State (about the size of England) is well intersected with railways. Some of the cities are really very pretty,—streets laid out with avenues of trees, in summer having a very pleasing effect, besides acting as a shade from the sun. There are several very fine cities, Albany being the seat of the State Legislature; and the House of Assembly, if built according to the drawings of the architect, will be a very imposing affair; but it seems to your correspondent, that if the cities would patronise bricks, instead of timber and limestone, there would be fewer fires, and the buildings erected would be of a more substantial character. New York city, in the writer's opinion, is a long way from a Paris, and never will approach London. The Central Park is a very beautiful place, with good skating-ponds, and fine walks; but there is a great deal too much "shoddy" in the "*turn-outs*," and one can see at a glance, like mock jewelry, it is very good for display, but, after all, not the genuine article.

Just now the municipal powers in New York are likely to be comfortably provided for in the State prisons, for merely robbing the City Treasury of a few millions of dollars. Could the writer but have had the privilege of surveying or estimating for the repairs of broken windows, he would have had now a "*splendid stone front*" *in the 5th Avenue.*

QUERCUS.

TURNERS AND WOOD TURNING.

HAVING seen a letter in your issue of December 16th upon "Wood Turners and Wood Turning," I hope you will favour me by publishing a few words upon the subject. "Wood Turner" thinks with Mr. Olley that if a man can produce two specimens from an architectural drawing, he must be a good workman. I must differ from them, as a good turner is expected not only to work from architects' drawings, but to do a hundred and one things that an architect would not think of; and allow me to say that as a rule (at the West end of London, and I dare say it is the same at the East end), when turners work from a drawing, if it is so ordered, they copy it exactly. As for what a turner can earn, I know men who consider themselves first-rate workmen, who, if they were paid full prices for their work, would never earn even moderate wages. Your correspondent wishes turners would combine to produce good work, and stand out for fair wages. There is now a society in existence for these purposes; but although it is flourishing, it has not received the support it deserves from the trade; and if "Wood Turner" be a journeyman, I hope he will add practice to precept, and join the society, and give the members the benefit of his twenty years' experience; and if he be a master, if he will address a letter to me showing what course the society ought to follow for the improvement of the trade, it shall be laid before the members, and it will be certain to receive careful consideration.

It is a pity so many apprentices are taken by men who do not know how to teach them their trade, but there are masters who do employ journeymen, and take apprentices, who are incompetent in every sense of the word. There is one who considers himself the first turner in London, and works from architects' drawings: he has had several apprentices, and his foreman says that he never turned one of them out as a first-rate workman. As for inferior workmen being obliged to become masters and ruining the trade, the masters have in a great measure themselves to thank for it, on account of the many inconveniences they put their men to, such as working in dark and badly ventilated workshops, having inferior lathes and tools, and in some instances keeping them waiting for their money. I have had to wait for two hours, and then go away short of half my earnings, and when I began my work on Monday morning, found my employer was in the country recruiting his health (with my money). Such things as these make careless workmen, and often drive men to the public-house, when they are waiting about on Saturday for their money. There are many first-rate workmen who have started in business for these and similar reasons. I shall address another letter to you more fully upon this subject, and likewise upon the late competition for the freedom of the Turners' Company.

W. A. BARBER, Secretary,
The Society of Journeymen Wood Turners in General, Southampton Arms, 350, Euston-road, N.W.

"A REVIVER FOR SOUTHAMPTON."

SIR,—Observing a letter under the above heading in your issue for December 23, 1871, signed by one who describes himself as knowing the district well, and as having given close observation to the subject, permit me, as secretary to the South Midland Railway Company, to express my surprise that your correspondent should state the saving in distance between South Wales and London, by the proposed tunnel, at twenty-four miles, when the promoters only set it forth at sixteen miles.

The case with which he makes companies with antagonistic interests work over each other's lines, and allow through rates at low charges, at the same time getting over difficulties on paper which have proved insurmountable in practice, is simply amusing.

Is he aware that the line from Southampton to Salisbury is South-Western; from Salisbury to Bath and Pilning Great Western, more than half of this being but a single line, and therefore incapable of accommodating the traffic of this port, extremely circuitous, and with bad gradients against the load?

Does he remember that the totally neglected country traversed by the South Midland is as fully entitled to consideration as regards railway facilities as its terminus, and that no comparison can be drawn between Mr. Fowler's high-level and costly bridge and that proposed at Sharpness, since Admiralty regulations can present no difficulties, the fact being that high-masted vessels do not go higher up the river than the entrance to the canal?

If your correspondent be interested against us, let him remember he will do his own case no good by misstating ours.

J. E. LE FEUVRE, Secretary.

*** With this the correspondence may end.

KENSINGTON ROAD AND HYDE PARK.

THIS main arterial thoroughfare, in its extent from Regent-circus westward to Kensington for a distance of two miles and a quarter, may be termed the grand Boulevard of London; the corresponding Bayswater-road on the north side, extending for a mile and a half along the Park border, being somewhat inferior in width of roadway, but having the advantage of more important buildings along its line.

The abatement of the old Park boundary brick walls, and the substitution of a handsome iron railing, have altogether changed the character of both these thoroughfares, and at the same time have given an apparent extension to the grounds and plantations within the *enceinte*. In the Bayswater line no paltry ranges of mean shops border the road, nor sever the continuous sylvan view; because on this line successive ranges of noble terraces have been erected within the last forty years, which, from their happy position, fetch double the rental of equivalent structures in other parts of the town.

On the Kensington route it is far otherwise: the most valuable portion of the Park border, extending from Albert-terrace, Knightsbridge, to near Rutland-gate, for the length of half a mile, is curtained off by ranges of paltry old shops, and by the still greater blot (so far as the frequenters of recreative grounds are concerned) of the antiquated cavalry barracks of Knightsbridge. The backs of the old houses have been judiciously planted out by landscape gardening, trees, and shrubs; but the barracks advance 30 ft. upon the Park drive, exhibiting windows and troopers, in dress and undress, to the extent of 450 yards!

The principal object for improvement is, however, not the Park border, but the grand Western Boulevard. From Kensington the road is sufficiently wide, and nearly direct, until approaching Prince's-gate, the Park side footway is gradually widened from 10 ft. to 20 ft.; the railing preserving its lineal direction as far as the west side of the gateway; when on the east side the fence is protruded 18 ft. at a sharp angle upon the causeway, the south slope continuing onwards to the barracks; so that this building cuts off the view of nearly the entire width of the causeway, thus marring the line of route in this its most valuable portion. Here Princes-terrace, Ennismore-place, Rutland-terrace, and the adjacent highly-improving quarters are choked in, and muffled up by unsightly shops and public-houses; as the barrack is an insuperable obstacle to all improvement, even in this position, which would otherwise command a *tenfold rental*.

There are other sites such as the Chelsea Guards' Barracks, which would be much more suitable to the Horse Guards, and even nearer to Buckingham Palace and the Houses of Parliament. The plot occupied by the barracks measures in length 400 yards by a mean width of 60 yards; and on the road line of this plot, at least 20 ft. might be thrown out into the road, to enlarge the causeway, and open a continuous view as far as the junction with the Brompton-road. Upon this site a range of Park-side mansions might be built for a length of 300 yards, leaving a marginal plot of 30 ft. in width on both the Park and road frontages, giving at least 3,000*l.* a year in ground-rents, so as in some measure to defray the expense of improved quarters for the troops, and at the same time to realise incalculable advantages for this the best quarter of fashion, which has been so long under the ban of squalor and depression.

In completing the allineation and opening of the Boulevard to Albert-gate, there is, however, a range of nine paltry shops which should be cleared away, so as to open out the vista from the range of Albert-terrace on the east end, and the stables of his Grace the Duke of Wellington, occupying an area of 180 ft. by 90 ft., might possibly spare 20 ft. in depth along the Knightsbridge-road frontage for the public accommodation, and for the realisation of so grand a metropolitan improvement. These stables cover every foot of the large area, extending from the line of Park-wall in the rear, to the Knightsbridge footway in front, advancing on the latter 40 ft. farther than the barrack façade.

As viewed from Hyde Park-corner, just opposite Apsley House, from which the inner Park Drive and the Fair Mile Ride branch off, this southern border reach of Park presents a charming prospect. The borders are laid out in the most perfect style of landscape gardening: shrubs, fine forest trees, and flowers adorn its whole extent, as far as the Serpentine head and falls. But walk along it. For about 500 yards an appropriate iron railing fences it off from the main Piccadilly route; and then a narrow wedge of paltry and antiquated shops clings on to the old Park wall, as far as a modern chapel, with two public-houses as supporters, one on each hand; a pawnbroker; and lastly, the residence of the French ambassador, a handsome structure, at Albert-gate. In continuation, two fine houses follow on the opposite gate piers, and then there are five or six warehouses and workshops, built right up to the Park wall; after which the gardens of Albert-terrace open out, and redeem the stigma of huddled, shapeless, and crazy tenements. Next comes up to the wall the less offensive range of six houses in Park-place, and then, of course, a public-house; lastly, the barrack boldly intruding its unsightly red brick elevation, still unblushingly advances 30 ft. *upon the Park drives*. Well, what is the consequence? Why, the Park fashionable drive ends here, and a quadruple line of equipages during the season *stops short of it*, returns, and circulates within a range of a quarter of a mile!

A great portion of the tumble-down houses in the line belong to the Dean and Chapter of Westminster; and if we look to their possessions in courts, lanes, and the vile slums near the Abbey, there is small hope of improvement through their mediation. But this is a great and vital public question for some Governmental authority, or for the Board of Works. All the public parks have been wondrously improved of late, and the benefits derived from them by an increased and cumulatively growing population fully attest their value—no plant is disturbed, no flower plucked—and this shows their gratitude.

The parochial authorities of Kensington have of late widened the main street opposite to their new church now in progress; their co-operation in rectifying the grand Piccadilly boulevard would insure its completion. The extension and enlargement of great thoroughfares already undertaken by the Board of Works will no doubt prove highly beneficial to commerce, and to the inhabitants generally; but the improvement and widening of our old-established lines of intercourse, and the removal of blots that are odious in the eyes of foreign visitors would not only relieve our metropolis of discredit, but aid in elevating it to the rank it ought to hold, as being at the same time the wealthiest and the most beautiful in Europe.

QUONDAM.

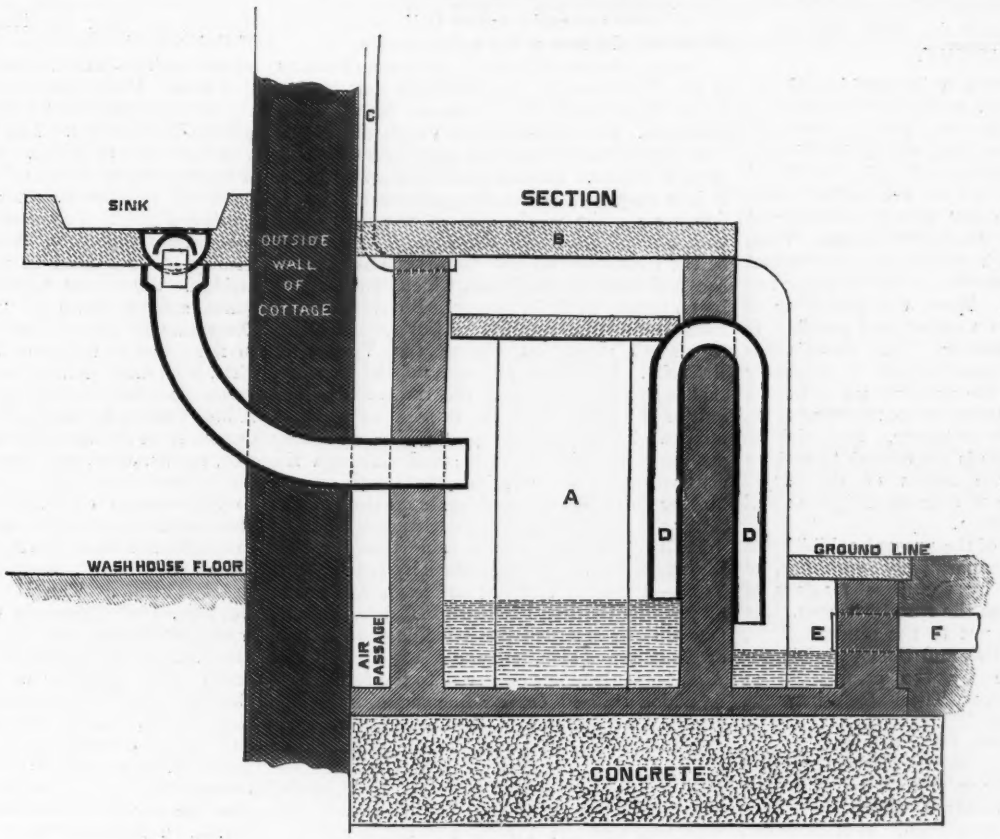
THE WOODEN STAIRS IN THE COURT THEATRE.

IN reply to a letter from "Y" in a recent number stating that "there is a flight of stairs made of wood, leading from the street down to the pit of the Royal Court Theatre, Chelsea," Mr. W. Emden, as the architect of the theatre, writes:—"The pit steps are of stone, surrounded and entirely supported by brick walls, with a stone landing at head and foot; and the same can be said of all the other public stairs in the building. 'Y's' letter appears to have been written under a misapprehension arising from a cause which I proceed to explain. After the Court Theatre had been opened to the public the landing at the head of the pit stairs was enlarged, and to meet this enlargement the stone steps from pit to street (about seven in all) were cased with wood. This casing is completely cut off from the general woodwork of the theatre, and even though the building were burnt to the ground, yet would the stone steps from pit to street, with their wood casing, remain intact, or nearly so: that they would continue to afford safe egress during the most violent conflagration must be at once apparent from my explanation."

This reply does not remove the objection raised. A landing having been formed at the top, as stated, the wooden flight of stairs is, of course, in advance of the stone steps, said to exist, to the extent of the width of the landing. The Building Act demands that stairs in theatres shall be of stone, or other fireproof material, and those down to the pit here are not so. "Y," therefore, is quite correct in objecting to them, and did not write under any misapprehension.

MONUMENT TO THE LATE BISHOP LONSDALE, LICHFIELD.

THE monument which has been erected in Lichfield Cathedral to the memory of Bishop Lonsdale, who, after an episcopate of twenty-four years, died in October, 1867, has been publicly unveiled. The memorial, which is a fine work of art, stands underneath the arch on the north side of the sacrarium. It consists of base, recumbent effigy, and canopy, with three elevations and pinnacles. In the base, which is composed of layers of green marble of various shades, and of alabaster, there are medallions in alabaster, with carved shields containing the late bishop's crest and symbolical representations. Around the upper edge of the base is engraved the following inscription:—"John Lonsdale, D.D., Bishop of Lichfield, born January 17, A.D. 1788; deceased October 19, A.D. 1867. Erected by the diocese in memory of his eminent learning and piety, his unwearied labours, and paternal care, during an episcopate of twenty-four years." On the massive base



Self-Acting Syphon Sewage Tank.

there is a recumbent figure of the bishop, in full canonicals, with pastoral staff at the side, mitre on the head, the hands raised as in supplication, and the feet resting against the typical dragon. This figure is in alabaster. From the base rise four pillars of green marble, surmounted by foliated capitals. These, with four flying buttresses in yellow Mansfield stone, support the canopy, from which rise three richly-carved hoods and a number of pinnacles. The canopy is in Painswick stone. The hoods are surmounted with figures of angels, in alabaster. The whole is rich in carving.

The monument, which has cost 2,000*l.*, was designed by Mr. Gilbert Scott. The work, with the exception of the recumbent effigy, which was executed by Mr. Watts, the painter, was carried out by Messrs. Farmer & Brindley, Westminster. Some who remember the mild face of the late bishop seem to think that the expression on the features in the effigy is a little too harsh, though the likeness is good.

SOANE'S MONUMENT.

SIR,—I have read with much interest the correspondence in the *Builder* between a "Soane Student" and a "Lover of Truth," and can confirm the statements of both correspondents, for at the beginning of last year the tomb of Sir John Soane was in the deplorable condition described; it has, however, since been repaired under the inspection of Professor Donaldson and myself, at the expense of the immediate descendants of Sir John. This is the second time within the last nine years that the monument has been repaired at great cost, but we have no means of securing it from future wanton injury. The trustees of the Soane Museum in 1870 opened a correspondence with the parochial authorities of St. Giles-in-the-Fields, who repudiated their liability, and suggested the removal of the monument to the Soane Museum!

I entirely concur with your correspondents on the disgraceful neglect of our closed cemeteries. Why should there not be a legally-qualified Board to supervise and protect these cemeteries, many of which contain the remains and monuments of by-gone worthies? In some rare instances they have been planted and rendered pleasant places of resort—small breathing-places in our crowded metropolis. The cemetery of St. Giles-in-the-Fields ought to be an especial place of pilgrimage for the lovers of English art, containing as it does the remains of our great sculptor, Flaxman, and of Soane. JOSEPH BONOMI.

Soane Museum.

SELF-ACTING SYPHON SEWAGE TANK.

SIR,—A short account of this apparatus, which has now been for several years in successful action at some cottages of mine in Essex, may be of interest.

I may premise that when the cottages came into my possession the sewerage arrangements consisted of privies of ordinary construction for the excreta, and simple holes in the ground near the scullery for the house-slops; these holes, as well as the privy cesspool, being emptied at intervals, and the contents spread on the gardens. The privies were readily converted into earth-closets by reducing the cesspool in size, rendering it water-tight, and providing buckets and scoops for the earth; but at first the tenants would not use any earth at all, and, eventually, all they could be induced to do was to throw down earth occasionally, and that in quantities quite insufficient to absorb the moisture of the excreta and urine slops. The objection of the tenants to the use of the earth arose not merely from the trouble involved, but from a notion that it spoilt the contents of the cesspool as manure. Perfectly as the dry-earth system effects the innocuous disposal of the excreta, with proper care, my experience convinces me that nothing short of almost daily superintendence will secure this care in the present state of ignorance and indifference of agricultural labourers, even of the better class.

The question of how to dispose of the sink and scullery slops was more troublesome. There was no drain they could be run into without causing a nuisance; and how were they to be applied to the land in any way that should be self-acting? Ordinary surface irrigation would require too much attention; and sub-irrigation, by underground pipes, though more promising, was open to the great objection that the small amount of sewage would not be able to force itself any distance along the pipes, but would lie in one place, and gradually choke them. To overcome this difficulty, I devised the Self-Acting Syphon Sewage Tank. The accompanying sketch shows the tank as it has been actually in action for the last three years. The sink is connected by a trapped iron pipe, with a small water-tight tank (A), covered with a movable stone cover (B), and provided with a ventilating pipe (C), which is carried up the outside of the cottage. The outlet from this tank consists of a syphon pipe (D), so arranged that it will not discharge any sewage till the liquid in the tank rises above the top of the syphon, when it at once becomes charged, and empties the tank very rapidly. As soon as the sewage is lowered to the level of the bottom of the syphon (which is a short distance above the bottom of the tank, so as to leave a space for the deposit to be cleared out periodically), the syphon is thrown out of action, and allows the tank gradually to fill again with sewage. The syphon discharges through a small well (E) into a drain (F) leading to the sub-irrigation drains, which latter consist of common 2-in. agricultural drain-pipes laid about 12 in. below the surface of the cottage gardens. The sewage flows out of the joints of the pipes, fertilising the soil, and purifying itself.

The syphon arrangement has these two important advantages,—first, that the concentration of the flow of the sewage, effected by discharging the collected supply of several days in a few minutes, forces the liquid a considerable distance along the sub-irrigation pipes, and prevents their being choked; and, second, that the intermittent action of the syphon gives full opportunity for the soil to purify the sewage, on the principle of "intermittent downward filtration." Of course, unless the land itself is naturally porous and dry, it must be underdrained, with special precautions: otherwise, the sewage will penetrate direct into the drains, without sufficient passage through the soil to purify it. I experienced this difficulty from the garden (the subsoil of which was mild clay) having been previously drained without any reference to its being irrigated; but, notwithstanding this drawback, the sewage was, under ordinary circumstances, entirely absorbed by the soil.

The sub-irrigation pipes were intended to be taken up and cleaned annually, and provision was made for readily doing this, by laying them on a continuous bed, formed by dividing larger pipes longitudinally into two equal parts; but it was actually found unnecessary to disturb them for nearly three years. A strainer has recently been introduced to intercept the solid matter from the syphon, which will, no doubt, render the action of the pipes still more satisfactory; and I am also making arrangements for having the whole apparatus constructed complete in iron, with various improvements, which will, I believe, render it cheaper, more efficient, and portable. Though designed for cottages, the apparatus is evidently applicable to any house where a dry system of disposing of excreta is used, and where there is a garden or other land below the level of the house to which the liquid sewage may be advantageously applied by sub-irrigation. ROGERS FIELD, C.E.

THE OLD MASTERS AT THE ROYAL ACADEMY.

FEW things would give a better idea of the latent and wide-spread wealth of this country, even in objects of fine art, than a summary account of the 270 pictures which, in this the third year of this self-imposed task, the Royal Academy have collected from the galleries and apartments of public and private owners, and hung on the walls of Burlington House. True, there is room enough and to spare,—vacant saloons and single rows of paintings in one or two that are not vacant. True, the gathering of 1872 falls far short in number, and possibly in interest, of its predecessors. True, that there is much now exhibited which, even if it originally illustrated the art of the great names it boasts, or gave unmingled pleasure to the spectators, can be said to do so no longer. But, with all these admissions, there is yet enough to make a morning spent in the rooms of the Royal Academy an occasion of extreme delight as well as of valuable instruction.

The main feature of the present exhibition is a large number, comparatively speaking, of admirable portraits, by the first masters of picture portraiture that the world has seen. An opportunity is given, not to the student alone, but to the skilled artist, and the ripe critic, for improving his taste by the comparison of noble works of Vandyck, Titian, Gainsborough, Rembrandt, Rubens, Velasquez, Sir Joshua Reynolds, Romney, and other painters.

As an instance of the rare educational value of the exhibition, we may refer to a most valuable set of studies, by Vandyck, which have been lent by the Duke of Buccleugh. It is, however, a doubt whether these monochromes are not sketches, of course by Vandyck, made for the engraver. Among these there is one of the Infanta Isabella Clara Eugenia, the Vice-Queen of the Low Countries, whose name is so familiar to the student of the time of the Emperor Charles V. She is represented, not in a widow's dress, as stated in the catalogue, but in that of a religious order, with her rosary by her side. The little panel on which this sketch is made, is, like the rest of this important series, some 9 in. by 7 in. The whole character of the Infanta has been grasped by the genius of the painter, and firmly, yet delicately given in the sketch. There is the heavy Austrian chin (the inheritance, together with the Tyrol, of Pouch-mouthed Meg), treated with grace, but without weakening the force of the feature. There is the eagle glance and the commanding brow and nose of one born in the purple. Now the Earl of Hopetoun has sent the full-sized painting of which this small panel contains the study. It is a magnificent picture, 55 in. by 44 in., in admirable preservation; and yet, grand as the picture is, it hardly renders the countenance with the vigour of the sketch. The juxta-position of these two historic treasures is extremely interesting.

It is not the fault of the Academy that Rembrandt had two mothers,—or at least that we are presented with the portraits of two very different old ladies under this title. One of them, No. 68, the property of the Earl of Hopetoun, is a *replica* of the well-known No. 775 of the National Gallery, the bust being (if memory is reliable) a little more full-faced in the Earl's copy than in that belonging to the nation. The latter is inscribed, "Æ. S. I. E. (*Anno Ætatis Suæ*) 83," and dated 1634. It was formerly in the Erard collection, and has not been identified by the careful compiler of the catalogue of the National Gallery with any known subject. The second portrait at Burlington House is numbered 179, and belongs to the Duke of Buccleugh. It is a very different countenance from that of the old lady in the ruff. Attired in the dress of a nun, with a thoroughly Rembrandtesque gloom thrown by the hood, and relieved by the white pinners, this noble old dame is reading a ponderous volume. Her features approach nearer to the regal curves of the Infanta Donna Clara than to the somewhat bunchy outline of the other portrait. But what is very remarkable is, that although there is no resemblance that can be traced between the modelling, or the technical drawing, of this fine countenance and of that of the painter himself (of whom a portrait, also belonging to his Grace of Buccleugh, and numbered 181, hangs near, very closely resembling No. 221 in the National Gallery), one may well imagine that there is a likeness. Nothing is so subtle as family likeness. In the present instance, the similarity of outline is between the old lady in a ruff and the painter; but a deeper sympathy seems to lie between his genius and the face of the noble woman.

Foremost amongst the most interesting features of the Exhibition is the Raffaelle lent by his Royal Highness the Duc d'Aumale, No. 95 in the catalogue. This brilliant little Virgin and Infant is an undoubted work of the great master whose name it claims. It is on panel, 18¼ in. by 11 in. It is in very good order, and judiciously framed, lighting up the whole side of the apartment with its red and blue drapery. The features of the Infant are on the same type as those of the Aldobrandini Madonna, which, however, it by no means rivals in beauty. But the loving, half-wondering expression of the mother's face is almost unrivalled among the Virgins of Raffaelle. It is the expression, not the painting, that is so admirable; and the treatment of the hair of the child is—as far as memory serves—unique. Little rays and glints of glory spring out from the tiny hairlets; and although the conventional nimbus is indicated, both around Mother and Child, the self-luminous tints of the latter are wonderfully imaginative and divine.

Probably of more actual value than the solitary Raffaelle are two paintings by Leonardo da Vinci,—the most cultured and learned, if not in all respects the first, of the great Italian masters. One of these is a Madonna belonging to the Duke of Buccleuch (117), on panel 18¼ in. by 14 in. A curious injury has occurred to the forehead—on which a raised curved line suggests the idea that the upper part of the head has been restored. It is, however, most probably, an evidence of the barbarous piety that imagines that it adorns pictures of saints by attaching crowns of silver or of gold to the canvas. The complexion of the Virgin is of the lovely olive brown so often to be seen in the works of this master. The hair falls in crisp, almost wiry curls; the face of the Infant, who is contemplating a little cross, is almost sentimental. But the motive of the picture is that very Cross. As the child regards the symbol, so does the mother regard her child. The composition is, of course, masterly; the face of the Madonna, especially the mouth with its shadowy outline, exquisite. The large-sized hand must have been painted from the real model of the painter. The greenish blue of the background, where sea fades into sky, has suffered more than the rest of the picture. This painting is one of the highest value and interest.

The second Leonardo is the portrait of a young man, on panel, 21 in. by 14 in., the property of Mr. W. Fuller Maitland. It would be difficult to point out a picture so limited in size and in subject which more fully illustrates the genius of an unsurpassed artist; and yet it is one which a person might be pardoned for passing, if he only saw it closely, without remark. Full of cracks in the paint, faded in the colouring, with the modelling of the right hand so much obliterated that the outline appears to be out of drawing, a close inspection shows more traces of the ravages of time than of the magic of art. But stand at that distance at which Leonardo, in his *trattato di pittura*, defined that a picture should be seen, or a little further off, and the form becomes instinct with life, the hand reassumes mobility and beauty, and the face looks forth with a noble individuality that dwells long on the memory. The figure holds a scroll on which is written, in Lombard hand, the date 1494, the words ANO 20, and the monogram M. R. The portrait has rare value.

Correggio is unrepresented in the exhibition. We may say the same of Titian; none of the four paintings attributed to that prince of portrait-painters bearing any visible marks of so illustrious a pedigree. Titian, indeed, may be said to be nobly represented at second-hand; for Hilton's "Ganymede," the property of the Royal Academy, has been evidently inspired by the "Ganymede" of Titian in the National Gallery. In fact, the first impression was, "how much better lighted the picture is here than in the Gallery!" The treatment, however, is different. The noble head and mighty plumage of the royal bird, his soar across the field of vision, the charming face and eager heavenward look of the boy, the tender grasp of the eagle, which holds the quiver of the "Ganymede" rather than his flesh,—all these are elements of a very fine picture. The attitude of the bird is questionable; so it is with the eagle of Titian.

Other Italian masters in respectable numbers are more or less worthily represented by one or more pictures. Of Giorgione there is the "Temperance" belonging to the Royal Academy, famous for its glorious hair, but with a lip betokening anything but temperance in passion. Of Guido Reni there is one of the stock figures, women with up-turned eyes and wounds of body or of mind—Cleopatras, Magdalenes, or what not. This one is called Saint Agatha. The right hand is beautifully drawn. The countenance is palid with the pallor of death. There is a fine study of two figures by Andrea Mantegna, lent by the Duke of Buccleuch. Three Tintorettos are harsh and grim. In one of them, a very ill-composed family picture, the first person of the Trinity is introduced in a most inconceivable fashion. Sir Coutts Lindsay sends three portraits, entitled those of "the Painter's Three Daughters, by Palma Vecchio." It is impossible to recognise in either of these three squalling girls, with mouths most unpictorially open, the Juno-like beauty whom Bordone loved to paint. A holy family, by Palma Vecchio, is lent by the Queen, from the Hampton Court collection. In this, the St. John, who has attained to manhood during the infancy of his divine cousin (contrary to the opinion of St. Luke) has a fine face ensconced in a veritable bush of hair. A nobly modelled and tenderly treated St. Sebastian, by Palma *Il Giovine*, is attributed in the index to *Il Vecchio*. The Holy Family by Parigi Bordone, from Hampton Court, is an inferior work, for which these same damsels of the Palma family have been models. Sir William Drake sends a fine painting of Piero de' Medici, by Bronzino, in good preservation, with massive features, and most uncompromising aspect—a thoroughly characteristic portrait. Two very poor specimens, said to be by Sandro Botticelli, are without interest, unless it be from the fact that the worse drawn of the two is exhibited by Mr. G. D. Rosetti; which may explain certain peculiarities of style. One picture is attributed to Annibale Caracci, two to Gaspar Poussin, and one to Nicholas Poussin, which are best complimented by silence. The most noticeable work of the minor Italian masters is a large *noli me tangere*, by Baroccio, 110 in. by 74 in., the property of Mr. Wentworth B. Beaumont. If abstraction can be made of the utterly undignified conception, and thoroughly conventional treatment of drapery, this is rather a pleasing picture. The composition is effective, although the left leg of the Christ is nowhere to be seen. The colouring is bright and lively; the Magdalen, the reverse of either a mourner or a penitent, is a remarkably gay, pretty girl, coquettishly and tastefully dressed. The shadowy outline which gives such delicacy to the faces painted by this artist is most conspicuous in these two very youthful countenances.

Passing to the great feature of the exhibition, we note no less than thirty-two paintings by Vandyck, a most unusual wealth of portraiture. Of these a couple of dozen are the studies contributed by the Duke of Buccleuch, to one of the most remarkable of which we have above referred. The portrait of the Marquis Spinola is lent by the Earl of Hopetoun; the complexion as fresh as if painted last year. The stern, crafty face looks out from the canvas as if its owner were ready for intrigue or for war. Nothing but the gleam on the armour recalls the lapse of nearly two centuries and a half. The portrait of James Stuart, Duke of Richmond and Lennox, is lent by the Duke of Buccleuch. It is a wonderful physiognomical study, and a marvellous painting. Then comes the noble Governess of the Netherlands, before mentioned. The profile of Henrietta Maria, Queen of Charles I., lent by the Queen from Windsor Castle, with a bust as flat as a pancake, shows that, as with lesser painters, the magic of this great master's touch might at times be impaired by the weight of a royal command. We should be much obliged to the writer of the catalogue to explain whom he intends to designate by the title of the Queen of Philippe le Roi,—a full-length portrait of a full-formed young beauty, in a black dress, half frightened at her own splendour. The bunches of pale brown curls, and faintly defined eyebrows, of which the right is arched more than the left, agree with the inscription, "Æt. Suæ 16, 1631." The husband of this stately girl, the Counsellor Le Roi, not the King of Spain, a noble-looking man, also in black, with sharp face and hand resting on a noble deerhound, is the companion picture. These fine portraits, 80 in. by 48 in., belong to Sir Richard Wallace.

By Rubens there is one portrait only. It is life itself—a man in a ruff and sable-lined robe, lent by Earl Brownlow. There are three landscapes, with cattle and figures, by Sir Peter Paul, tolerably well known; the "Timber

Wagon" (51), "The Rainbow" (125), and "The Watering-place" (195). Five paintings are attributed to Rembrandt—the old lady in the ruff, who was eighty-three when the painter was twenty-eight, which disposes of the maternity question; the old lady in conventual dress; portraits of the Burgomaster Palikan and his wife, the former in a falling ruff, with a fine sad countenance, looking out from the canvass, and a chubby ugly boy—the latter with a miraculous quilted ruff, within which is a very vigorous and masterful life. The child, to whom she is giving a dollar, has an unmeaning face, older than that of the mother. The signature "Rembrande," casts some doubt on the authenticity of this portrait, as well as on the companion piece, exhibited by the Duke of Buccleugh.

Sir Richard Wallace lends two portraits of Spanish Infantas, by Velasquez. These pictures, together with some others from the collection of the late Marquis of Hertford, seem to have suffered by long keeping in the dark. Nine pictures have the assurance to claim Holbein as their father. If the portrait of Archbishop Warham be from the easel of Holbein, he must have intended it for a sign-board. The portraits of Sir W. Butts and his lady, are subtle in their physiognomical power. The keen, penetrating glance, and irritable yet humorous mouth of the physician to whom Shakspeare flung a crumb of immortality, are admirable. The lady looks well content to be so.

There are seven pictures by the English Vandyck, Nos. 140, 202, 247, 254, 257, 260, 263. The first of these, the portrait of Lord Camden, shows how noble a fine face may look in a formal wig. There is a soft, shadowy outline to the features of the great judge that recalls the touch of Baroccio. The second, belonging to the Marquis of Hertford, is gone. It looks like the ruin of a Romney. It is inconceivable that, as mere matter of manipulation of colour, it should be by the same artist as No. 247, a very fine, bright portrait of Vestris, a young man in a full mass of powdered hair thrown back from the face. Lady Mary Boultby looks out from the canvas with her blue eyes, set off by her grey powdered hair, and square-cut red silk dress. No. 257 is rather gone. It might stand for Jonathan Wild. Lady Lucy Douglas is wonderfully poor for a Gainsborough, if such it be. Mary, Duchess of Montague, grand-daughter of the Great Duke of Marlborough, a stately and beautiful lady, might almost be taken for a portrait of Maria, Marchioness of Ailesbury.

The sixteen works by Sir Joshua Reynolds are enough to fill the mind with rage. Certainly there is sufficient to prove that this great painter was not over-estimated by his contemporaries. But here and there a picture, left as it came from his brush, shows what terrible havoc Time has wrought with the majority of his paintings. We are familiar with many of them by engravings. But the best of these reproductions are but feeble shadows of the fleeting beauty of the originals. We know Reynolds only by ghosts. The exquisite beauty of the "Comedy," who has enchained Garrick—and small blame to him—by her irresistible charms, is not even hinted at by the engraving. This noble picture is sadly gone. "The Jessamy Bride," two portraits, the "Infant Academy," Lord Hertford's portrait of a Lady in a blue dress, the charming "Infancy," the fascinating Nelly O'Brien, are faded, tarnished, or cracked. In Mr. Cowper-Temple's "Girl leaning on her Hand," with a face so full of fun, the bitumen comes out in pitchy bubbles. "Cupid Disarmed" is sadly spoiled. The ruin of these beautiful pictures is rendered more deplorable by the striking contrast afforded by the admirable condition of Lord Hertford's portrait of Mrs. Robinson (143), in which the charms of a somewhat discontented beauty are fresh and bright.

Sir Peter Lely's portrait of Lord Chancellor Clarendon in his robes is a noble picture. The florid face, youthful aspect, trim moustache and royal of the historian, seem an anachronism when attired in the gold and black robe of State, with the heavily embroidered purse for the Great Seal on the table. There is a fine portrait of a Sculptor (88), in which a marked trait of the sculptor's hand,—the division of the little finger from the others,—is marked. The head is dignified by a cloud of yellow hair,—the falling band is tied in an unusual and very picturesque fashion. The portrait of the Countess de Gramont is from Hampton Court. That of Lady Elizabeth Wriothesley is marked by the overstrained histrionic attitude so common in the painting and sculpture of the day.

A RESPONSE TO THE QUEEN'S LETTER.

DECEMBER 30TH, 1871.

THE letter of her Gracious Majesty to her people has been read far and wide, and has touched the hearts of all. We need make no apology for printing the following response.

A GOOD and gracious ending to the year
Thy letter to thy people comes, O Queen!
Right welcome to them are its genial words,
Breathing calm confidence and trust serene.

Calm confidence in their firm loyalty,
And trust serene in their large, loving heart;
'Tis not the first time thou dost truly say,
That in thy sorrow they have taken part.

How their hearts wept with thine ten years ago,
When he who well deserved those anguish'd tears—
ALBERT THE GOOD—was taken from thy side—
Thy loss and theirs, to ever-coming years.

Yes; still they mourn that upright man, who lived
As if he held from Heaven the high behest
To prove himself to his adopted land
True bearer of his motto—TREU UND FEST!

And when, but now, the darken'd wings of Death
Seem'd closing once more o'er thy sadden'd soul,
Thy people's prayers for thy son's life went up
To Him who can both life and death control.

At length, when better tidings were sent forth,
And hope revived within each watcher's breast,
How joyfully they hail'd the cheering words,
Which gave their anxious fears some little rest.

And now they wait, in tremulous regard,
For every whisper from that royal home,
And feel it is their own peculiar friend
Who from Death's shadowy portals back doth come.

If it could be that any closer tie
Were needed, 'twixt the nation and its head,
'Twould surely spring from this deep sympathy
Which centres round our Prince's still sick bed;

And from thy noble-hearted words, O Queen,
With those of that sweet lady by thy side,
Whom thou dost call thy daughter, and who long
Has been thy faithful people's joy and pride.

May God in mercy grant our mutual prayer,
And soon again to health and strength restore
The son, the youthful husband, father, friend,
Whose kindly face we long to see once more.

R. F. H.

THE NEW GUILDHALL AT WINCHESTER.

THE ceremony of laying the foundation-stone of the proposed new Town-hall and Public Offices at Winchester, which had been postponed on account of the illness of the Prince of Wales, was performed on Friday, the 22nd ult., by Viscount Eversley, the high steward of the city. The new building, which will be situated on the south side of the High-street, nearly opposite to St. John's House, includes a large assembly-room, 85 ft. by 45 ft., a council-chamber or sessions-hall, magistrates' room, public museum or library, offices for the town clerk and city surveyor, committee-rooms, police station, with apartments for superintendent and policemen, fire-engine house, &c., the whole of the interior being warmed by hot water. In the centre of the principal front a clock-tower rises to a height of 120 ft. to the top of the vanes, the faces of the clock being 85 ft. from the ground, and if illuminated will be seen from most parts of the city. The design of Messrs. Jeffrey & Skiller, architects, of Hastings has been accepted, the estimated cost being 11,000*l.*; and Messrs. Joseph Bull & Sons, builders, of Southampton, have contracted for its erection for the sum of 10,496*l.*

The mayor and corporation assembled at half-past one o'clock, and a procession of the civic, clerical, and other authorities, headed by the band of the 60th Rifles, escorted Lord Eversley to the site of the new hall, where the stone was laid with the usual formalities, in the presence of a large crowd of spectators. On arriving at the site, Lord Eversley expressed his thanks to a merciful Providence which had enabled them to meet after the postponement. The mayor then requested Lord Eversley to lay the foundation-stone, and Mr. Alderman Budden, as chairman of the building committee, briefly described the intended new structure. The Archdeacon of Winchester then offered prayer, and Lord Eversley, having been presented with a silver trowel, laid the stone. The mayor thanked his lordship for the performance of the ceremony, and he, in return, addressed the mayor and citizens in a graceful speech, alluding to the fact that Winchester claimed the precedence of London for municipal institutions.

DRAINAGE OF WEYMOUTH.

SOME time ago, after a visit to Weymouth, we commented somewhat strongly on the sanitary condition of this otherwise agreeable watering-place, especially in connexion with the state of the Backwater. We are glad to hear that the Town Council are now considering a plan which has taken six months to prepare. It is proposed to construct a dam across the Backwater, and to form intercepting sewers, so as to carry the sewage from the Backwater. The system of sewage irrigation is also proposed, the estimated cost of the whole works being 27,600*l.* The scheme is said to be generally approved by the local authorities, and will, it is expected, be speedily carried out. If the town be wise they will allow no time to be lost after satisfying themselves that a really good plan has been obtained.

THEATRICAL.

AMONGST the good things going on at the theatres just now—and there are several—should be specially noticed "Pygmalion and Galatea" at the *Haymarket*, "The Bells" at the *Lyceum*, and "On the Jury" at the *Princess's*. The Greek interior prepared for "Pygmalion" shows care, and is very satisfactory. The statue was modelled by Mr. Birnie Phillip. The writing of the piece is admirable, and, if we mistake not, it will live. Miss Robertson particularly distinguishes herself in it, and Miss C. Hill displays force which few gave her credit for. The acting of Mr. Henry Irving in "The Bells" is a thing to be seen, and places the actor high in his profession.

Covent Garden.—Mr. Augustus Harris has again succeeded in producing incomparably the best pantomime of the season, both as regards its composition and getting-up. The story of "Blue Beard" is followed with consistent burlesque, and the scenery, processions, and ballet are fittingly gorgeous. The review of the troops, with a military revel, is one of the most remarkable scenes of its kind ever presented.

COMMON SENSE IN STAGE SCENERY.

WHEN considerable thought and expense are bestowed, as now, upon the imaginary fairy scenes at our theatres, to satisfy the tastes of the public, as also in competition one house against another, it is very distressing to find that a little common sense is not bestowed upon the scenes of ordinary pieces, especially in reference to the positions of doors and windows. Let me state one example, which is like many, as an illustration of the want of common sense. The fact that the *Builder* was the first who struggled to reform stage-scenery will be my excuse for sending this to you. In the neat piece now being played at the Princess's, wherein two of our best actors in their individual walk, and a very promising and improving young actress, take part, there is a scene of an interior, which is made use of more than once, and where, facing the audience, there is a window, showing a distant view of the clock-tower of the Houses of Parliament and the tops of many houses, which, no doubt, is intended to make the audience understand that the river Thames flows between the room in which the action takes place and the prospect seen through the window. Within 5 ft. or 6 ft. of this window, in the same wall, is a much-used *door*, so much used, indeed, that I was kept in a state of excitement whenever an exit was made, expecting that a violent scream would be heard from the person just departed, on account of his having tumbled headlong into the street, if not into the bosom of Father Thames; and, what is still more ridiculous, in one instance the departed was looked after by

one present in the room, who, gazing through the open doorway, turned his face towards the position of the window. In reality such an arrangement is impossible; in ideality it is truly ridiculous; and I ask again, why cannot a little common sense be brought to bear upon such matters, which destroy all truthfulness in any piece placed before playgoers who may be otherwise carried away with the natural and painstaking acting of the performers? Y.

OXFORD-STREET TRAMWAYS.

BY the reproduced and reprinted London Street Tramways (Extensions, &c.) Bill, which was rejected by the House of Commons last year, it is proposed that powers should be conferred upon the company to lay somewhere about 16½ miles of tramway in some of the principal streets of London. The thoroughfares include Edgware-road from Kilburn, Oxford-street, Grand Junction, Marylebone, and Uxbridge roads; Holborn, Holborn-circus, St. Andrew's-street, Shoe-lane, St. Bride-street, Farringdon-street, and Ludgate-circus; Goswell-road, Aldersgate-street, and St. Martin's-le-Grand; the Borough High-street, York-street, and St. Thomas-street, Denman-street and Duke-street; Marylebone-road, Chapel-street, Upper Baker-street, and Albany-street; Harrow-road, Portobello-lane, Westbourne Bridge, Westbourne-terrace, and Bishop's-road; Craven-road, Eastbourne-terrace, and London-street. The promoters bind themselves not to lay their lines upon or along the London Bridge Railway Station or station-yards, or any of the streets, roads, or other approaches leading thereto from the Borough High-street or Wellington-street without the consent of the companies in writing under their common seals. The railway companies will not be the only or the most formidable opponents of the proposed tramways.

INAPPROPRIATE CLOSING OF THE BRITISH MUSEUM.

SURELY some of our public institutions are managed with very little wisdom. On New Year's day the British Museum was closed for the purpose of being cleaned and making additions to its collections. It will be re-opened to the public on Monday next, the 8th inst. But why close it on New Year's day; another week would surely answer the purpose if it need be closed at all. We saw scores of holiday people within a brief space of time, who had toiled up to the Museum looking with dismay at the intimation that they had toiled for nothing, and worse than that, that their day was spoilt. Let us suggest to the trustees that another arrangement should be made next year.

THE DESTRUCTION OF BOILERS.

SIR,—My engine boiler, a Cornish one, nearly new, is much pitted or eaten on the upper side of the flues, which I attribute to the alum in the water. Of course it never encrusts or "furs up." I think of introducing some hot lime into it, to counteract the sulphuric acid of the alum. The boiler is now empty and dry, except the small "pits" (which are nearly half through the plates, and about ¼ in. diameter), which are wet with a fluid of rather a sweet taste and of iron. Will any of your engineering friends assist me?

W. D.

THE MINEHEAD RAILWAY.

THE first turf of this line was cut on the 28th ult. The contractor for the execution of the works is Mr. Frederick Furniss, of London. The finances requisite for the undertaking have been raised independently of the public. This branch line of railway leaves Watchet by a junction with the West Somerset Railway; and it was intended in the original Bill to cross the two turnpike-roads (one of which leads from St. Decumans, and the other from Doniford to Watchet) by level crossings; but, on the representation of the inhabitants of that place, it was afterwards arranged to divert the least important road, and the other to cross over the railway by a bridge near Mr. Thorne's yard; thence through the pasture-field, over the mill-stream and meadow, and cross the Mineral Railway at Whitehall, running by the side of that line up the valley, until within about half a mile of Washford. It then curves to the right and enters a deep cutting on the north side, and closely adjoining the turnpike-road at the Green Dragon stop-gate, this being the most important piece of work throughout. Soon after it enters the valley at Old Cleve, and runs down to the sea at Bradley-gate, where it is intended to erect a station for Blue Anchor, Carhampton, &c. Thence from this point it runs parallel with the seashore, and between Higher and Lower Marsh there will also be a station for Dunster, &c., which is rather over half a mile distant. Afterwards it is a perfectly straight and level line to Minehead, the terminus being near the beach. The contractor is to complete his undertaking by the end of the year 1872, and the railway will afterwards be leased to and worked by the Bristol and Exeter Railway Company, with whom terms have been arranged.

COMPETITION, BERLIN.

WE are requested to announce that the First Commissioner of Works has received a programme for the erection of a new House of Parliament at Berlin, for which the architects of all nations are invited by the Imperial Government to compete. The particulars will be reprinted for the use of architects, and be ready for distribution at the Office of Works on Monday next. The designs will have to be sent in to the Imperial Chancery at Berlin, with the authors' names, before the 15th of April next, and a prize of 844*l.* will be given for the best design, and a fifth of that amount for each of the four next best designs.

"JACK PLANE."

SIR,—Would you oblige me by receiving the inclosed 1s. (stamps) for the benefit of the widow and children of the late Mr. Randall (Jack Plane), and at the same time allow me to appeal to all working men who have been readers of the sensible, manly, out-spoken letters our deceased friend was in the habit of writing in the *Builder*, to contribute a trifle, according to their means, and so in some measure to console the widow and fatherless. An accident, any day or hour, might reduce those near and dear to us to poverty. ONLY A TAILOR.

SURRENDER OF HOUSES BY A BANKRUPT TO THE SELLER.

IN the Court of Bankruptcy, before Mr. Registrar Spring-Rice, *in re* Lessiter, Mr. Webster, on the part of a debtor, who is a builder, made an application to the Registrar, under the 23rd section of the Act, under the following circumstances:—Shortly before he presented a petition for liquidation he had contracted with the owner of some building land to purchase two carcasses of houses and fit them up, and he now wanted to surrender them to the seller.

The Judge said that in all bankruptcy cases such an application could only be granted after notice.

Mr. Dalton, who represented the trustees, stated that there were no rights of third parties to be interfered with. It appeared that a building contract had been entered into, between a person named Evans and the petitioner, that Lessiter should buy two carcasses in Tuffnell Park-road, at a ground-rent of 8*l.* each, Lessiter contracting to finish them, and lay out 300*l.* The trustees were most anxious to disclaim the property, inasmuch as the charges upon it would be more than its value, and they were in this position,—they must either disclaim or be called upon by the ground landlord to complete the contract.

Under the circumstances of there being no third parties to be injured, the application was granted.

THE QUESTION OF WAGES.

WE are requested to state that a copy of the following has been forwarded to the employers in the building trade of London and vicinity:—

"Paviors' Arms, Johnstone-street, Westminster, January 1st, 1872.

Sir, — As the representatives of the Operative Stone Masons' Society in London and district, we again take the liberty of addressing you, in accordance with a resolution passed at a general meeting of the above-named society in reference to the nine-hours question, and also another matter appertaining thereto, viz., the question of wages. And in referring to these questions, we would beg leave to draw your attention to the rapid and daily increasing adoption of the nine-hours system throughout the country, and to the innumerable number of artizans that will commence that system from this day, at the same wages for the nine hours as they previously received for ten hours; and in many cases this has been conceded by the employers without a request from the employed. Another significant fact that we would call your attention to is, the adoption of the nine-hours system by several of the large railway companies,—a class of employers that hitherto have not proved themselves very anxious to meet the just demands of those in their employ, not even sufficient to secure the public safety. Seeing such to be the case, and knowing that employers in the building trade of London and its vicinity have generally been willing to meet any just requirements of those in their employ, providing that reasonable notice of those requirements be given to insure the employers against any serious loss, we therefore beg to give you notice that the masons of London and its vicinity are desirous of continuing the nine-hours system, as at present established, all the year round, instead of expiring on the 14th of February, as now arranged, and that we are willing to work at the present reduced rate of wages for the next six months; and that on and after the 1st of July, 1872, the wages be 9d. per hour, making our average weekly wages, as near as possible, the same under the nine-hours system as that hitherto received for the ten hours.

We hope, sir, that, in considering this request, you will keep in view the foregoing remarks, and grant us a favourable reply at your earliest convenience.—I remain, sir, your obedient servant, P. WEIGHELL,

Secretary to the Committee.

Resolution passed at a General Meeting, Nov. 30th, 1871.—"Resolved, That our committee memorialise the master builders of London and its vicinity, asking them to concede the nine hours permanently, after February 14th, 1872; and give notice, at the same time, that on and after the 1st of July, 1872, we shall require an advance of 1d. per hour."

BUILDING ACT CASES.

AT the Woolwich police court, before Mr. Patterson, on Wednesday last, Mr. Collis, district surveyor, summoned Mr. William Tamsett, builder, of Charlton, for neglect to give notice for certain works done at No. 1, Inkerman-terrace, Charlton; to wit, constructing brickwork and flue to two coppers, the plea set forth being that the work was there before, but required rebuilding. The magistrate decided that Section 20 brought the work within the rules. Penalty, 20s.

HOUSE-DRAINAGE.

SIR,—An article in your valuable journal of last week, under the above, and signed, "D. A.," suggests that corporations should take this work entirely into their own hands, *it* being the *only* means of having satisfactory drainage. I would venture to suggest that the "respectable builder," or firm, should be employed for this work, without being subject to cutting down the price to the lowest fraction, which, of course, leaves no alternative but to encourage bad work. Is drainage the only work found fault with? Is it not a fact that works of every description have to be done over again simply because the "respectable builder" is cut out of his work through men who know or care not how work is done, so long as they make a profit? Who, may I ask, is to blame in this matter? Is it to be supposed that a speculative builder has no more sense than to spend 30*l.* or 40*l.*, in order to make a good and complete job, if he is only to receive one-half this amount from his client in return? Again, are corporate bodies, as a rule, all perfection? Would it be impossible for such a body of gentlemen to have the pipes laid to the wrong inclination, or even *upside down?* Let the public be satisfied to pay a fair price to respectable men, and doubtless they will get fair work in return. W. H. W.

THE ACTUAL CONDITION OF WARWICK CASTLE.

THE Chairman of the "Warwick Castle Restoration Fund" has sent us the following report on the condition of the building:—

"*Dec.* 28, 1871.

Dear Sir,—In reply to your request that I should send a statement of the extent of the destruction caused by the late fire at Warwick Castle, I beg to forward you the enclosed report.

The most ancient parts of the Castle are the vaulted basement under the state rooms, hall, &c., the main wall on the river front, some internal walls, and the towers and gateways on the courtyard walls. All these are uninjured by the fire.

The international decorations have been executed at periods ranging from the date of Charles II. to the present time.

The distinction between the state apartments and those used by the family is not so marked as has been supposed.

The whole of the rooms have been more or less occupied.

The present family, in order more freely to admit the public, have chiefly inhabited the east wing, but have never given up occupation of the rest when occasion required.

The main walls of the east wing are of the same date as the west. The rooms have been entirely reconstructed, and some years have been spent in decorating them with objects of antiquity procured from Italy and elsewhere.

The following is a list of the rooms and principal objects destroyed:—

The Hall—totally, except the outer walls, the roof of which was constructed about forty years ago, when the remains of a very early roof were discovered (1150). The panelling was of the

date of Charles II. All the furniture, chests, silks, embroidery, tapestry, the principal portion of the armour, including the buff coat of Robert Lord Brooke, and Charles Edward's sword, are entirely lost.

The Marble Floor is also much damaged.

The Large Dining-room—partially injured.

Breakfast-room (*temp.* Charles II.), the Library, Lord Warwick's Sitting-room, and Staircase are totally destroyed.

Lady Warwick's Boudoir—Partially burnt.

Three rooms had been recently reconstructed and filled with ancient furniture and fittings, comprising Italian chimney-pieces, doorway and columns from Rubens's house at Antwerp, old Italian bookcases, tables, &c. The most valuable books and pictures were preserved; but a portrait of Francis, Earl of Warwick, by Gainsborough, a portrait of the first Lord Brooke, and various others, were destroyed.

Above were seven bedrooms, furnished with old leather pictures, carving, &c., all totally destroyed.

Above the dining-room were three large bedrooms, with other rooms above them; these also are destroyed, as well as three rooms on the basement.

The contents of the dining-room, state rooms, and armoury passage were removed, and are uninjured.

The whole of the state rooms and chapel west of the hall were not touched by the fire.

A. SALVIN, JUN."

CONSECRATION OF RYDE PARISH CHURCH.

ON Tuesday the new parish church of Ryde—the corner-stone of which was laid in August, 1869, by the Princess Christian, as the representative of her Most Gracious Majesty the Queen, and which has been built by Mr. Gilbert Scott, R.A.,—was consecrated by the Bishop of Winchester.

The structure is not yet completed. The tower and spire are not commenced, and the ornamental details of the exterior are not fully carried out. The north porch, too, is not at present begun. The great east and west windows are by Messrs. Clayton & Bell. The interior carving of the church has been executed by Messrs. Farmer & Brindley. The capitals of the arcades are cut in foliage, natural leaves alternating with conventional through the series. The pulpit is of variegated alabaster, and is based upon a cluster of fluted columns of polished Derbyshire marble. It is octagonal, two of its sides being open to form an entrance; the other six are deeply sunk in panels, into each of which are introduced subjects sculptured in white alabaster, each panel comprising two representative figures of Old and New Testament or pre-Nicæan saints and martyrs. Thus there are combined Isaiah and Jeremiah as prophets; St. John the Baptist and St. Barnabas as preachers; St. Peter and St. Paul as apostles; St. Stephen, St. Alban, St. Agnes, and St. Catherine as martyrs; the sixth pair being the Virgin Mary and Mary Magdalene. This work has been executed by Messrs. Twigg, of Ashford, Derbyshire; and the panels are by Messrs. Farmer & Brindley.

THE SMOKE NUISANCE IN BRISTOL.

A FEW days ago Mr. Arnold Taylor, of the Local Government Office, attended at the offices of the Board of Health, Bristol, in pursuance of a memorial from certain ratepayers, to make an inquiry with reference to the smoke nuisance in Bristol. A large number of tradesmen and others tendered evidence to prove the existence of a great nuisance in smoke, smuts, and deposits of small coal. Among the large establishments generally complained of were Messrs. Fry & Sons' cocoa manufactory, Messrs. Finzel's sugar refinery, Counterslip; and the Porter Brewery, in Bath-street. The proceedings lasted about six hours.

At the close, a discussion took place, in the course of which the Government Inspector said his opinion was that an inspector should be specially appointed to look after the smoky chimneys, and he suggested that other cases might be taken before the magistrates. The smoke nuisance would never be abated in large towns until they got the local authorities to take severe measures, and make it a matter for general police duty. They had a stringent Act in London, and it was put into the hands of the police, and every policeman on the beat had orders to report every case of smoke nuisance to his inspector. The Inspector mentioned incidentally that in Bradford the local authorities had taken the matter in hand, and the nuisance in that town had been reduced quite 50 per cent. What he wanted the Board of Health to do was, to look at it in this light, that a smoke nuisance was a preventible nuisance, and that it could only be dealt with by careful and continuous inspection; and he suggested that the Town Council might appoint a Smoke Committee independently of the Board of Health.

Eventually the Inspector intimated that he should report what he had heard to the Local Government Board.

Books Received.

"CHOLERA and Typhoid Fever: a Plan for the Collection and Disposal of Sewage on the Separate System. By J. B. Waring, F.R.I.B.A., &c. Day, Savoy-street, Strand." Mr. Waring here advocates what seems to us a very impracticable system, however correct it may be theoretically; and above all impracticable on the great scale for towns. The Moule dry-closet system is a good one, as an adjunct in country districts, or in or adjoining bedrooms for the use of the sick, &c.; but Mr. Waring out-Moules even the Moule system. He says,—

"The plan I propose is this. Keep the fluid and solid refuse of your houses carefully apart. In every house there should be a well-built and spacious soil-shaft, with which every closet is to be connected. The seat of the closet is furnished with a pan having two separate vents, one for the liquid, the other for solid excreta. The liquid will flow off into a tank or reservoir prepared for its reception alone, and furnished with a tap, by which it can be taken off as required, and either be converted into ammonia, be used for any manufacture in which ammonia enters, or be otherwise utilised. The seat itself, when pressed on by the body, should cast a superficial layer of earth, sand, or soot, on the bottom of the pan,—the soot might be collected or kept in the house for the purpose; the excreta deposited, a covering layer of sand, earth, or other deodorising material, should be discharged over it, as in the earth-closet patented by Moule. The pan should be furnished with a reversible bottom, and the excreta, thus thoroughly enclosed by a deodorising coating, will fall into the soil-bin beneath, forming altogether a very powerful manure, and be taken away at stated intervals by a well-organised service of closed trains, very different to our present clumsy open carts: by steam-carriage in large towns, and by carts in small, or by hand in villages, to properly-constructed receptacles in the country, and be sold (I believe at a very great profit) for manure, either in the immediate neighbourhood or wherever desired, with perfect ease, and with freedom from danger to health to any human being. We shall thus, by the aid of a little thought and care, have transformed our demon of death into an agent of life.

The ash and dust bin may be kept separate from the soil-bin; that is a matter of the simplest arrangement, and can be easily effected by a separate shaft. The servants' closet might be separate, and attached to a separate ash-pit, having special openings to the dust-bin and liquid-tanks, for the riddance of basement refuse.

We have still the slops of our houses to deal with; and this is yet more easy, by means of a sink on one side of the closet, communicating by a pipe with the special slop-tank beneath or by connexion with the sewers, which are to convey away fluids only."

So, even on this system, we come to sewers and tanks at last. And yet Mr. Waring says:—

"Cesspools, drains, and sewers form a legacy from our forefathers which we shall act wisely henceforth to repudiate. Cesspools are generally abolished; drains and sewers we still stick to, and they to us. By the addition of more water, great care, improvements of construction, and the separation of the liquid from the solid matter at the reservoir, we shall have freed ourselves from their most deadly results; but we have only 'scotch'd the snake, not killed it.'"

——"Specification of Sir George Bowyer, bart., for Improvements in the Construction of Road Tramways. Clayton & Co., Whitefriars, Printers." Sir George has patented a simple plan of laying a tramway in asphalte, the wheels merely running in an easy groove a little below the level of the road, and into and out of which they can readily go. The asphalte is to be laid upon concrete, and can be drained by pipes beneath. If sharp-edged wheel-tires, he notes, wear the asphalte rapidly, they may be rounded off. This might be done in the case of the cars, but other wheels might waste the asphalte as well.

——*The Garden* says,—What a pity it is we do not contrive some less expensive and more attractive way of destroying the thousands of evergreens planted about London every year, than that of planting them and allowing them to blacken and perish before our eyes from the effects of our smoke-pested air. There perish annually as many beautiful young evergreen shrubs and trees in and near London from smoke as would suffice to plant a whole country. We know no greater evidence of obtuseness of mind than is shown by this persistent wasting of precious time and precious energy, and destruction of healthful and beautiful young evergreen trees and shrubs. It cannot be too widely known to every town-planter that so long as we are satisfied to live in a sea of the refuse of our fire-places, so long shall we find it impossible to have in cities healthy specimens of vegetation that retain their foliage in winter.——The *Art Journal* for the new month, says of Japanese Paper:—"Upwards of 250 distinct species of paper are manufactured in Japan. Many kinds made in the distant provinces are submitted to a distinct process in Yedo, and each kind has its distinctive name. Specimens of all these have been deposited, by the care of the Foreign Office, at the South Kensington Museum. We have little doubt that the manufacture of paper in this country will be affected by the acquisition of this valuable knowledge as to the mode of preparation of an article very superior to our own. The point most against the introduction of the bark of the *Bronssonetia* to our mills is, that it is not until the fifth year that the stools or shoots of the tree, resembling the shoots of the hazel in English coppices, are available for bark. The importation of the peeled fibre will probably be attempted. The substitution of a finer vegetable paste for any coarse and inferior size is no doubt one great cause of the excellence of the Japanese paper. The Tororo root would probably bear exportation as well as the fibres. If perfectly clean and pure fibres and roots were introduced, and Japanese workmen induced to show the process employed by them to the foreman of one of our mills, there seems little reason to doubt that, with the aid of our excellent machinery, we should soon produce such admirable paper as the world has never yet seen."

Miscellanea.

Warwick Castle.—On Tuesday evening in last week, the second meeting of the Warwickshire Archæological and Natural History Society was held at the Court-house, Warwick, when Mr. Tom Burgess, of Leamington, gave a brief history of Warwick Castle, from the earliest period to the time of the "King Maker." The lecturer gave an interesting account of the ancient earthworks yet remaining on the line of the Avon, and pointed out that these were evidently the frontier fortresses of an early tribe. Warwick was doubtless one of these frontier posts, and the mound in the court-yard was probably the site of this fort, if not the original mound itself. The subjection of Warwickshire to the Romans was dwelt upon, and then Mr. Burgess read the extract from the Saxon chronicle giving an account of the erection of the castle at Warwick in 913, not 915, as stated by Dugdale. This castle was one of a series of frontier Saxon fortresses erected by the daughter of King Alfred to repel the incursion of the Danes settled in Derbyshire and Leicestershire, on the east of the Watling-street Road, under their chief, Guthrun. The story of Guy and the Dun Cow was traced to the contemporary conflicts with the Danes, for Dun Cow was probably but a corruption of Danegau. Sketches of the original fortresses, and the probable appearance under Ethelfleda, and Turchill, were made on a black board. The demolition of the old castle, by the adherents of Simon de Montford, led to a summary of the progress of military architecture, and the present castle of Warwick owes much of its design to the lessons gained at the famous siege of Kenilworth, and the subsequent Scotch and French wars. It was this experience of the powers of attack and defence which induced Thomas, Earl Beauchamp, to erect the towers and outer defences on the east of the castle, as we see them now. Some floral legends connected with this period, the *planta genista*, the forget-me-not, and a peculiar Warwickshire legend of the red rose were related. The fact that Wycliffe translated the Bible, and that Chaucer and Gower were living during the building of the castle, was mentioned.

Photographs enamelled on Copper.—The *Illustrated Australian News* states that at Clunes a photographer named John Tanner has, after four years' labour, succeeded in producing photographs enamelled on copper. We may state, however, that five or six years ago a photograph was sent us from Canada which seems to have been enamelled on zinc. It had all the delicacy and fine texture of a daguerreotype without its metallic glance.

International Trade-marks. — The following American case is reported by Haseltine, Lake, & Co., patent solicitors:—"An equity suit respecting trade-marks, of international interest, was recently decided in the United States Court for the Washington district. The suit was instituted by Mr. David A. Burr, counsel for Rogers & Sons, the celebrated cutlers of Sheffield, against Philp & Solomons, contractors to the Treasury department for the supply of Rogers & Sons' cutlery. The plaintiffs alleged that the defendants had supplied counterfeit articles with their trade-mark, and they asked the court to grant an injunction, and claimed heavy damages. The defendants did not deny the sale of imitation articles or the use of the trade-mark in question, but proved that these articles were manufactured in Prussia by a firm known as Rogers & Sons, who use the trade-mark under a royal licence, and that Prussian cutlery bearing this trade-mark had been extensively imported and sold in the United States for many years, and also that the plaintiffs had not registered the trade-mark, as provided by the recent Patent Act. The defendants contended that the suit could not be maintained in view of the above facts. Wylie, J., refused the injunction chiefly on the ground that the plaintiffs had, by their acquiescence in the infringement, waived their right to assistance from the court, and he also stated that the Prussian firm was entitled to the use of the trade-mark where the cutlery was manufactured. The acquiescence of the plaintiffs was presumed, no evidence being offered to show that the trade-mark had been used with the consent or knowledge of the Sheffield firm. The judge did not comment upon the fact that the plaintiffs had not registered their trade-mark, but the registration of trade-marks in the United States is now a matter of the first importance to English manufacturers and merchants, for which provision was made in the Act of last year."

Building Materials and Fire.—Mr. Mullett, the supervising architect of the Washington Treasury Department, U.S., has been interviewed. He says:—"Cast iron, absurd as the statement may appear, will not resist as much heat as good sound oak timber of the same dimensions. Fire expands the iron and warps it and breaks it very easily. Indeed, if oak timber should be treated by any of the processes of liquid silicate, it may be considered almost a fire-proof material compared with cast iron. As for stones suitable for building purposes, as I told you before, there are few that are fire-proof, though some approximate the necessary conditions, and, except in severe conflagrations, may be generally depended upon. Granite, marble, and sandstone are not to be trusted, as they soon perish by exposure to the heat, as has been shown a thousand times. But I am strongly in favour of liquid silicate as a preparation for wood to be used for building purposes. My attention was directed to this material some years since, but I have not had an opportunity to investigate the subject fully. I believe, however, that it merits more attention than any other suggestion that has been made public, and may yet prove one of the most practical solutions of the question of non-combustible construction that has yet been offered. Whether this or some other process for making wood incombustible is the more desirable, I am not prepared to say. I am, however, decidedly of the opinion that any process by which wood can be rendered non-inflammable at a reasonable cost would not only be an inestimable blessing to the public, but its use should be rendered imperative by law."

Accidents.—On Tuesday, during a heavy gale, a large brick building, the Rosebank Engineering Works, at Bonnington, near North Leith, was blown down. The loss is said to be upwards of 4,000*l.* Three or four men had a narrow escape.——While the petty sessions were being held in the village of Killyclogher, in Leitrim, the floor of the court-house gave way, and about 300 persons fell to the ground floor, a height of 18 ft. The magistrates and attorneys escaped unhurt.

Motive Power for Street Vehicles.—It is reported from New Orleans that a new way has been discovered to use ammonia as a motive power, the principle being that of the ice-making machine. Motion is obtained by rapid evaporation and energetic absorption. An ammonia-engine is said to have made 800 trips, and drawn a car at a much cheaper rate than it could be drawn by horses.

The Royal Institution Lectures.—Dr. J. Tyndall, F.R.S., is delivering a series of six lectures "On Ice, Water, Vapour, and Air," at the Royal Institution. In his second lecture he illustrated a subject to which we adverted in speaking of the address of the president of the last meeting of the British Association,—namely, the principle of arborescence, in what we may call mineral life. Professor Tyndall showed some beautiful examples of crystallisation by making salts and metals deposit crystals from small quantities of their solutions placed in the electric microscope. Silver and lead ferns appeared as if endowed with life; crystals of ferrocyanide of potassium were seen growing, in pulsating waves, as if the crystallising force had to accumulate strength every few seconds to overcome some resistance,—a phenomenon which has not yet, it is believed, been investigated by men of science; at all events, the lecturer said that it was a novel observation to him. Crystals of chloride of ammonium grew, like delicate and graceful ferns. Finally, the lecturer showed how, beam by beam, Nature builds up the crystals of ice, every portion of the structure being singularly beautiful; and he melted a thin slab of ice in the electric microscope, so that the observers could see on the screen the star-like forms of which it is built up. Both old and young listened to the lecture, as usual, with the greatest interest and pleasure. The theatre was filled to overflowing, many of the listeners being only able to obtain standing-room.

Mr. Ruskin's Christmas Gift.—In his twelfth number of "Fors Clavigera" Mr. Ruskin tells his working-class readers that he has made them the Christmas gift he promised—7,000*l.* Consols in all clear—"a fair tithe," he says, "of what I had, and to as much perpetuity as the law will allow me." He adds:—"It will not allow the dead to have their own way long, whatever licence it grants the living in their humours, and this seems to me unkind to those helpless ones. Very certainly it is inexpedient for the survivors, for the wisest men are wise to the full in death; and if you would give them, instead of stately tombs, only so much honour as to do their will when they themselves can no more contend for it, you will find it good memorial of them, such as the best of them would desire, and full of blessing to all men for all time." English law, he thinks, needs mending in many respects; in none more than this. As it stands, he can only vest his gifts in trustees, desiring them, in the case of his death, immediately to appoint their own successors, and in such continued succession to apply the proceeds of the St. George's fund to the purchase of land in England and Scotland, which shall be cultivated to the utmost attainable fruitfulness and beauty by the labour of man and beast thereon, such men and beasts receiving at the same time the best education attainable by the trustees for labouring creatures, according to the terms stated in his book.

Proposed New Swimming-bath and Public Bathing Station at Brighton.—A memorial is now in progress of circulation, which will shortly be presented to the Town Council, petitioning them to lease a portion of the beach, opposite the Norfolk Hotel, to Professor Cavill, the champion swimmer of the South Coast, for the purpose of erecting a swimming-bath there, and also for the formation of a public bathing station. The size of the proposed bath is 60 ft. by 30 ft. It will be provided with about thirty dressing-boxes, and will be built of concrete below the beach up to the height of 12 ft. or 14 ft., the top being surrounded by a glass screen, something after the style of those used at the head of the West Pier. Mr. W. W. Eldridge, of Brighton, is the engineer. The bathing station would be situated on the southern side of the bath, and would be screened from the public gaze by canvas stretched on poles, and reaching from the eastern and western walls of the bath down to the water's edge.

Hoardings in Newington. — The *South London Chronicle* says:—A very necessary precaution has been taken by the Newington Vestry. Builders must in future put up hoardings before pulling down old houses on the Walworth-common Estate, and where footways are disturbed a temporary planked footway must be provided. But why limit these provisions to this one estate?

Edinburgh.—The North Bridge is to be altered and widened at a cost not to exceed 10,000*l.*

Cheap Telgraphic Communication with America.—It is proposed that the Governments of Great Britain and of the United States should purchase the existing cables and Newfoundland land-lines, paying for the same in terminable annuities, and charging only such rates for the use of the cables as will meet the annual interest charge. For this purpose, *one-fourth of the existing tariff would suffice for the present*,—that is to say, messages of ten words could be carried for 10*s.*, instead of 2*l.* It has been found that with each successive reduction in rates the use of the telegraphs has enormously increased, as is evidenced from the fact that the earnings are now much greater with the rate at 2*l.* than they were formerly at 20*l.* per message. It is believed that the reduction to 1*s.* per word would not be final, but that still further reductions might be made, and the number of cables increased on the same plan of terminabble annuities, without becoming any burden on the two Governments. The attention of the various Chambers of Commerce in Great Britain is called by circular to this question by Mr. G. T. Snead, of 21, Mincing-lane, London.

Accommodation for Private Patients in the Fever Hospital, Islington.—The pauper fever asylums having now relieved the Liverpool-road hospital of the very poor, the committee have rendered the hospital available for the reception and treatment of other classes of cases, including the working class not receiving parish relief. Patients will be admitted into the general wards on the recommendation of a governor or annual subscriber of one guinea, or, as heretofore, on payment of two guineas on admission, or of one guinea weekly. For such patients as require isolation and better accommodation, eight large rooms have been prepared and furnished with every requisite for comfort, in which a single patient, or two children of the same family or from the same school, can be received. The payment for one of these rooms, with the attendance of an experienced nurse, and the care of the resident medical officer and physicians, and including food and medicines, has been fixed at three guineas per week. Members of working men's families will continue to be received into the hospital on much lower terms, we presume, than these.

Arbitration Case.—A case of considerable interest has just been concluded at the Westminster Palace Hotel. The Ryde Corporation have determined upon purchasing the works of the Ryde Gas Company, and the latter being willing to treat for the sale, the price was left to arbitration. The witnesses for the Corporation considered the value to be under 30,000*l.*, and based their calculations upon a 16¾ years' purchase of the net annual profit, which they placed at 1,800*l.* This they considered fair, as, though the company is incorporated by Act of Parliament, they thought it should not be treated as such, while the Corporation had the power to purchase. On the other side, it was argued that the company was incorporated, and was thus entitled to a twenty years' purchase. They placed the annual profit at 2,800*l.*, and if this calculation was adopted, and a further sum allowed for surplus land and plant, the company would be entitled to a sum of over 60,000*l.* The arbitrators, Mr. Cawley, M.P., and Mr. Hawksley, C.E., with Mr. Hunt as umpire, have taken time to consider their award.

Pre-historic Relics in Cumberland.—At the last ordinary meeting of the Manchester Literary and Philosophical Society, Mr. R. D. Darbishire, F.G.S., gave an account of a remarkable discovery of pre-historic relics in Eden-side or Gibb Tarn, near Braystanes Station, St. Bees, Cumberland. The find is a remarkable one, and is said to be, so far, unique in England, affording apparently a characteristic instance of the forest moss-pits. A watchful observation had failed, so far, to detect any traces of piles or platforms, such as indicate what are known as lake dwellings. Mr. Darbishire exhibited and described a series of celts, more or less highly finished; certain very interesting specimens of wooden hafts for celts, clubs, and paddles; a quern, and several remarkable grinding-stones of different forms; and fragments of rude earthenware, found by Mr. Pinhorn, Mr. Quayle, and himself.

The Inventors' Institute.—A paper on "Inventions and Patents connected with Buildings," by Mr. Banister Fletcher, will be read this Thursday evening, the 4th of January.